



A MONOGRAPH  
ON  
DYES *and* DYEING  
IN THE  
North-Western Provinces and Oudh.

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ALLAHABAD:

Printed at the North-Western Provinces and Oudh Government Press.

1896.



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# A MONOGRAPH ON DYES AND DYEING

IN THE

NORTH-WESTERN PROVINCES AND OUDH.

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## CHAPTER I.

### GENERAL INTRODUCTION.

*Definition of Dyeing.*—Dyeing in India is regarded as the art of extracting colouring matters from various tinctorial substances, and of fixing them more or less permanently upon certain absorbent organic bodies of a fibrous character, such as cotton, wool, silk, skins, &c.

The most striking feature of the Indian art of dyeing is the capability of the native dyer to produce some of the most exquisite colours, by simple methods and with cheap appliances, usually of a primitive character. It seems to be an art of great antiquity in this country.

The early history of the development of the art in the North-Western Provinces and Oudh cannot be exactly traced out, as there seems to be no literature on the subject in existence.

There are, however, certain facts of history and tradition which tend to show that methods of dyeing were not unknown in these Provinces even in the earlier part of the Bráhmaical age. For example, Rája Ram Chandra, the famous *avatár*, who ruled at Ayodhya, is known to have been fond of using yellow-coloured garments. His brother, Lakshman, also used coloured materials for his dress.

Blue and yellow are said to have been favourite colours with *Krishna*, and red with *Hanuman*.

In the institutes of *Manu* we find certain precepts (quoted in chapter VII) regarding use of colours and sale of dye stuffs and dyed fabrics by the Bráhmans. These facts indicate without doubt that the art of dyeing was known to the Hindus and practised in Upper India in the earliest stages of the historic period.

“According to Pliny the ancient Egyptians were expert dyers and acquainted with the use of mordants *which it would seem they derived from Hindustan.*” (John Gardiner—Bleaching, dyeing and calico printing).

“The ancient Indians \* \* \* \* \* successfully practised the art and were even able to produce coloured patterns upon woollen and cotton fabrics, by processes analogous to those now in use.” (T. Sims—British Manufacturing Industries.)

*Theory of Colours.*—Nothing could be ascertained regarding the theory of colours according to the ancient physical science of the Hindus, and it is doubtful whether they ever established a theory about the phenomena of colours. The Muhammadan physicists of the middle ages, who were simply professors of the ancient Greek philosophy, however believed that blackness, whiteness and brightness (كَيْفَاتُ) were three distinct “qualities” (كَيْفَاتُ) of material substances, and their mixtures

in varying proportions produced various colours. On this principle they explained the composition of the principal colours to the Indian student of physical science as follows —

- (a) That a mixture of black and white produced grey.
- (b) That a mixture of black and the intensely bright produced bright red.
- (c) That a mixture of intense black and bright red produced deep red.
- (d) That a mixture of black with a comparatively large proportion of bright red produced yellow.
- (e) That a mixture of yellow and shining black produced green.
- (f) That a mixture of green with black produced dark green.
- (g) That a mixture of dark green with black and red in small proportions produced blue.
- (h) That a mixture of blue with red gave purple.

The theory, though now obsolete, is somewhat interesting, indicating as it does the extent of theoretical researches of original thinkers of the past.

On the practical side of the art of dyeing there is evidence to show that several colours originated in India during the Muhammadan historic period.

The Persian and Arabic names of certain shades, e.g., *Aqilkhāni*, *Badshāh pasand*, *Jilāni*, *Dilbahār Baizai*, &c., and the absence of their equivalents in Hindi, show that they were not known in the pre-Muhammadan days of Indian history.

The art, as a whole, seems to have been cultivated with greater energy in Gwalior than in any other place in the North-West of India, and the practical skill of the dyers of Gwalior is recognized unreservedly throughout the country up to this day. Dyeing in Al, no doubt, originated and acquired perfection in Bundelkhand, under the patronage of the local chiefs.

Jeypore, in Rājputāna, has long been in the enjoyment of special reputation for its advancement in the dyeing industry, and our provinces are indebted to it for, at least, some methods of dyeing.

The production of wool and manufacture of fine woollen fabrics in Kashmir and the Panjāb gave rise to the study and gradual development of the tinctorial art in the extreme west of Upper India, and with an import, in considerable quantities, of the Panjāb and Kashmir goods into the eastern cities arose the necessity for the presence in the latter of artisans who could dye shawls, and such men, therefore, came in to set up their business in the more important towns of the Gangetic plain.

Besides this a constant demand for the services of highly skilled dyers in the harems of the emperors and nobility of Delhi attracted dyers from all the dyeing centres to the metropolis of the Moghals, where, like other luxuries, the art of dyeing received no small amount of attention and encouragement from the wealthy class of inhabitants besides royalty. Similar reasons led to the development of the dyeing industry in Agra.

The fondness of the Emperor Muhammad Shah for coloured fabrics is proverbial, and seems to have been the cause of the nickname "Rangila" given to him by the people.

With the establishment of the Muhammadan kingdom of Oudh is associated chiefly the recent advance in the tinctorial art of the United Provinces. Dyers of cotton and wool came over from Delhi and Agra and settled in Lucknow under the auspices of the Nawābs. Calico-printers were invited from Farukhabad, and dyers of silk from Benares, under promises of liberal rewards. These artisans gradually improved the art in its various branches to the degree for which Lucknow still continues to be so famous.

The dyeing industry in Lucknow received its greatest impetus in the reign of Wajid Ali Shah, the last King of Oudh. On certain occasions admittance to the fancy fair at the Kaisar Bāgh was not allowed except to persons dressed in saffron-yellow garments, and this rule was often so strictly enforced that the name of *Kaisar Bāgh* (the king's garden) became corrupted into *Kesar Bāgh* (the saffron garden). On other occasions, the courtiers and their attendants were ordered to put on salmon-coloured dress before they could be entitled to the privilege of waiting upon His Majesty. The death of a queen at times called forth a royal command making it compulsory for every soul in the city not to appear except in black, and it was customary with the greater part of the Muhammadan population of the city to use black and green clothes during the month of Muharram. These circumstances gave rise to an extraordinary local demand for dyed materials, and induced dyers to work in the direction of improvement on the old methods, with a view to distinguishing themselves among their fellow-artisans.

The native industry maintained its flourishing condition until the appearance in the Indian market, about 30 years ago, of the European magenta dye, which in a few years proved a formidable rival to safflower. Later on, the introduction of a large number of other European dyes caused a revolution in the dyeing art of the country. Owing to their cheapness and the facility with which they can be used even by unskilled hands, they became more and more popular and gradually supplanted nearly all the native dye stuffs with the exception of indigo.

Native females in all classes of Indian society, formerly dependent almost entirely upon the skill of the professional dyer for one of their most favourite luxuries, were no longer in absolute need of his services except on special occasions. The professional dyers consequently lost a considerable amount of their custom, and naturally their income suffered enormously.

The reports from most of the districts show that a large number of them have been driven to find their livelihood by adopting other professions and trades and even by menial labour, and from some districts it is reported that if it were not for dyeing with indigo they would simply starve. Although the effect of the introduction of foreign dyes has been so serious upon the business of the native dyer, it cannot be denied that the poorer classes of people who could not, for reasons of expense, formerly dream of ordinarily using fabrics dyed in decent colours, now freely indulge in that luxury.

The use of foreign dyes is by no means confined to amateurs. The trouble and expense which the native dyer now saves by substituting a European for a native dye has led him also to adopt unhesitatingly the use of the former in his practice. The foreign dyes are not only used singly, but also sometimes in combination with native dyes, and the native industry has thus undergone a very remarkable change of late. The object of this little work, however, is not to deal in detail with the methods of dyeing with foreign dyes, but to treat of the subject of dyeing with reference especially to the native methods, and the remarks will therefore be confined chiefly to these latter methods.

## CHAPTER II.

### COTTON DYEING.

**Section I. General.**—The dyeing of cotton is carried on almost all over the United Provinces, and comprises the colouring of unspun cotton fibre or yarn and of the woven fabric.



*Dyeing of cotton wool.*—Cotton wool is dyed only occasionally and almost invariably with a red dye, and when so dyed it is used chiefly for spreading between the two coverings of the *razais* or *dulais* (day coverings used in the cold weather) of brides or of females specially fond of decorating themselves. The process of dyeing in this case consists simply in dipping the ginned cotton in the dye solution and drying the material in the shade.

*Dyeing of cotton cloth.*—The dyeing of cotton cloth is by far the most important branch of the industry, and is in the hands of two classes of Muhammadan artisans, viz. :—

(a) *Rangrez*, who dye fabrics in almost all plain colours.

In the majority of districts they call themselves Shaikhs or Patháns, but in Lucknow and adjoining districts most of them are Muhammadan *halwais* who were originally confectioners.

(b) *Nilgars*, who dye only with indigo.

In Aligarh there are certain Muhammadan *telis* (originally oil pressers) who have for some time taken to the dyeing trade.

#### *General description of the processes of dyeing.*

The successive processes generally employed in dyeing cotton in plain colours are as follows :—

(1) *Washing* (Dhulái).—The piece is first dipped in water and thoroughly washed by rubbing with the hands, until any starch that may be adhering to the cloth is got rid of. If the material is coarse it is beaten, while moist, with clubs with a view to completely separate the starchy matter.

(2) *Bleaching* (Merái).—This operation has for its object the removal of natural impurities existing in the cotton fibre and is carried on only in a few instances in plain dyeing, but very largely in calico-printing under which it will be described in detail.

(3) *Dyeing* (Rangái).—In dyeing with indigo the cloth is always dipped in the fermentation vat and moved about in the liquid until it has absorbed the required amount of colouring matter. In other cases the dyo bath is prepared with a decoction, an infusion or a solution (as the case may be) of the dye stuff employed.

The fabric most commonly dyed by the professional dyer is the *dupattá* (a sheet used by females to cover the upper part of the body), which varies from 2½ to 3 yards in length, and 1½ to 1½ yards in breadth.

For this reason it has been convenient to take a piece of these dimensions in most cases as a standard on which to reckon the dyer's charge, and the relative quantities of the various substances used in dyeing.

The piece to be dyed is dipped, soaked, steeped and occasionally even boiled in the dye liquid. Sometimes it is necessary to dye the cloth successively in different dye liquids which are kept in separate baths, and in the majority of such cases it is the practice to dry the piece after dyeing in each bath.

The purity of water used in dyeing, about which the dyers in Europe are so particular, is a matter of the least importance with the native dyer, and this is obviously one reason for want of brilliancy and tone in the colours ordinarily produced in this country.

(4) *Dipping in an acid bath* (Khatai dená).—This process is often resorted to with a view to fix the dye on the cloth, or to brighten or intensify the colour, specially in the case of safflower and turmeric. The acids most commonly used are infusions of mango rind and tamarind fruit. The infusion is sometimes added to the dye bath and sometimes employed to make up a bath separately.

(5) *Starching* (Kalap).—Wheat flour is kneaded and the dough rubbed with the fingers in water to separate the starch from the gluten. The latter is thrown away and the liquid holding the starch in suspension is boiled to make a paste of the consistency of honey.

About 1 to 1½ oz. of this paste is taken for each piece and dissolved in water acidulated with mango rind or tamarind infusion. The piece when dyed completely is plunged into the bath containing the paste, taken out, squeezed and dried. Sometimes a gruel made from rice is used instead of the above paste, but with less satisfactory results.

(6) *Clubbing* (Kundi).—The piece is then beaten smooth with wooden clubs.

(7) *Polishing* (Ghutái).—This is done with an instrument called *ghonta*, *dudli* or *mohrd* specially made for the purpose, but the employment of this process in plain dyeing is confined only to certain places in Bundelkhand and to certain shades dyed in Farukhabad.

*Dyeing of cotton yarn*.—Coarse cotton yarn is dyed largely for use in the manufacture of carpets in Aligarh and Agra.

In districts famous for country cloths, *e. g.*, Agra, Moradabad, Partábgarh, Fyzabad (Tandá), Rae Bareilly (Jais), and Lucknow (Maliabad) dyed yarn of finer qualities is used for weaving fabrics characterised by variously coloured patterns.

The yarns commonly used in the manufacture of the superior kinds of cloths are those imported from Europe, or spun with machinery at the Cawnpore and other mills. The use of country hand-spun yarn, which is confined to the manufacture of coarse fabrics, *e. g.*, *lilahi*, *gazi*, &c., is gradually diminishing.

Cotton yarn is now very largely dyed with European dyes, the only remarkable exception being in the case of blue and black colours, which are produced with indigo and other native dye stuffs. Before dyeing the yarn is thoroughly washed with clear water and is beaten with clubs. It is then dipped in the dye bath or steeped in it until the desired shade is produced. The dyeing in European dyes, which is a simple process requiring no professional skill, is done by the *Juláhdas*, the class of men engaged in considerable numbers in the weaving industry, but for dyeing in indigo the yarn is usually handed over to the *Nilgar* who dyes it in the *mát*. Yarn can however be dyed in almost any shade with native dyes. In fact the processes and the formulæ for dyeing yarn with various colours differ in no important particular from those ordinarily employed for dyeing cloth. Yarn is also dyed to a limited extent by *Koris* (a caste of Chamars), who weave certain native fabrics of the coarser descriptions.

The shades produced by the native dyer are numerous. For the sake of convenience they have been classified under two main heads:—

(a) Simple shades, *viz.*, those obtained from one dye substance or two substances yielding the same colour with or without the use of an auxiliary or a mordant. Sections II to V of this chapter will be devoted to this class of colours.

(b) Compound shades, *viz.*, those for the production of which it is necessary to combine two or more simple colours. The colours of this class will be discussed in the remaining sections of the chapter.

**Section II. Blue and its shades.**—The dye stuff which plays the most important part in the production of these colours is indigo, the only native tinctorial substance which has so far maintained its prominence in competition with European dyes.

The colouring principle of the indigo of commerce is known in chemistry as *indigotin*, whose composition is represented by the formula  $C^{10}H^{10}N^2O^2$ . Indigotin

is a thoroughly neutral substance, void of taste and smell, and has a specific gravity of 1.35.

This substance is however insoluble in ordinary acids, alkalies and water, hot or cold, and its application as a dye to the cloth therefore depends upon its conversion, in combination with nascent hydrogen, into another colourless substance known as "white indigo" ( $C^{10}H^{12}N^2O^2$ ) which is soluble in alkalies, and is re-convertable on exposure to the air by oxidation into the blue substance, indigotin.

The property indigotin has of combining with hydrogen to form "white indigo" is therefore of great practical value in the industrial use of indigo.

As a rule some agent has to be used which, in the presence of an alkali, will decompose water, retaining the oxygen and liberating the hydrogen, which may combine with the *indigotin* to form "white indigo."

The agents commonly employed with indigo for this purpose in England are ferrous sulphate, lime and water. The ferrous sulphate is ultimately converted into ferric hydrate, and the hydrogen of water liberated which combines with the indigotin, and white indigo is thus produced.

The native dyer is however entirely ignorant of the use of ferrous sulphate, but he brings about conditions favourable to evolution of free hydrogen by means of fermentation excited by the addition of lime and crude carbonate of soda with some saccharine matter to the indigo in presence of water, and by raising the temperature of the mixture if necessary.

The process of treating indigo in this manner is called "*mát banana*" and the oval-shaped vessel including the contents fermented is called *mát*.

Two different kinds of indigo vats are in use in these Provinces: one is called "khari" or "alkaline" vat and the other "mitha" or "sweet" vat. The methods of preparing the two vats will be described presently.

The main features of difference between the two are noted below:—

*In khári mát.*

*In mitha mát.*

- |  |  |
|--|--|
| (1) The fermentation is very energetic and rapid.  | (1) The fermentation is sluggish and prolonged.  |
| (2) Caustic lime is used.  | (2) Slaked lime is used and in smaller quantity.   |
| (3) The saccharine matter used is gur.   | (3) Sugar is used in the form of treacle known as <i>shira</i> or <i>chota</i> and in very much larger quantity.   |
| (4) The use of crude carbonate of soda ( <i>sajji</i> ) is essential.  | (4) No <i>sajji</i> is used.   |
| (5) The liquid does not keep long and is liable to get spoiled quickly.  | (5) The liquid keeps for a long time.  |
| (6) The amount of colouring matter yielded by a given weight of indigo is smaller than in the case of sweet vat, | (6) The amount of colouring matter given by the same weight of indigo is larger and the conversion of indigotin into "white indigo" is therefore more perfect, |

The following method of preparing the khari mát or vat is followed in the district of Cawnpore:—About forty gallons of water are poured into a large earthen vessel called *mát*, into which are thrown 2lbs. of *kachcha* indigo (the indigo being first rubbed into a paste in a separate vessel), 2lbs. of lime together with 2lbs. of *sajji*, and one ounce of gur (raw sugar).

The contents of the *mât* are stirred with a stick four or five times in the day. The process being called *mathná*.

In the hot weather, which accelerates fermentation, the liquid is ready for dyeing purposes within 24 hours.

In the cold season, however, it takes three or four days for the fermentation to be complete. When, owing to excess of cold, the fermentation does not set in quickly, the temperature is raised artificially by placing fire in small pits about 2 feet deep dug round the *mât*. Sometimes it is necessary to keep the fire on for full 12 hours in order to sufficiently raise the temperature.

To see if the liquid is ready for use the contents of the *mât* are stirred by the hand. If the liquid irritates the skin it is taken as an indication of the presence of an excess of alkali: about  $\frac{1}{2}$  lb. of molasses is thrown in in order to induce further fermentation, the acid set free tending to reduce the alkalinity. Fermentation is supposed to be complete and normal when the solution presents a pale green colour, readily recognized by the cultivated eye, or the hand being plunged into the liquid is stained blue when exposed to the air and no irritation is felt on the skin.

To prepare the *mât* properly requires some professional skill and experience. It gets spoilt occasionally through careless manipulation and it is exceedingly difficult to put it right then.

This fact has given rise to a saying in Urdu "*mât bigar jáná*," which means "to become hopelessly spoilt." Several such vessels (*mâts*) are usually sunk into the ground close to each other in the dyer's house and in these indigo is fermented at varying intervals, so that there may be always one or more vats ready for dyeing purposes.

If for any reason a vat completely fermented is not used for a day or two for dyeing, some more indigo and *sajji* are added to it in order to keep the solution fully active and strong. When in the usual course of dyeing the colouring matter of a vat is nearly all used up, the weak solution left is either allowed to remain in the same or transferred to another vat (not thrown away), and a fresh quantity of indigo, raw sugar and alkali put in to set up fermentation again. The addition of these agents at frequent intervals causes a gradual accumulation of undissolved matter at the bottom of the vat. The sediment is technically known as *tari* or *tali* and is commonly considered a very active ferment for fresh vats. For this reason it is occasionally obtained by one dyer from another.

The quantity of various ingredients used in the preparation above described is however only approximate. In fact it is difficult to give absolutely definite proportions in which the various articles should be used, owing mainly to the wide range existing in the quality of indigos sold in the bazar. The *pakka* indigo is a far more powerful dye than the *kachcha* and would be used in a comparatively small quantity to dye a given weight of fibre or tissue. Again two samples of the same variety may contain the colouring principle in varying proportions.

The native dyer therefore does not go by any formula, and his experience is his only guide in determining in each case the deficiency or excess of an ingredient in a fermentation vat.

Again if a dyer, for instance, has a large number of pieces to dye in the lighter shades of blue at a time, he would make up his vat with a smaller quantity of indigo than if he has to produce deep or dark blue shades. The solutions in the various vats of the dyer are therefore not uncommonly of different strengths.

The sweet vat (*mitha mât*) is commonly in use among the dyers of Lucknow where the following method of preparing it is followed:—Supposing that a vat has to be prepared for the first time, a new earthen vessel, called *mathor* or *math*, is sunk firmly into the ground. Into it are thrown about 60 gallons of water and 4 lb. of lime and thoroughly stirred. On the next day 4 lb. of lime are again thrown in, and

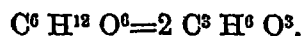
the liquid is stirred two to four times daily for about an hour each time. At the end of four or five days about 60lb. of "*tali*" (taken from an old *mát* already in working) are thrown into the *mát* and stirred up. About 4lb. of lime and 1lb. of treacle (the mixture being called "*Sharbati*") are then added to the *mát*. The liquid is stirred with a piece of wood twice daily for four days. The lime and refuse are then taken out of the water, and replaced by 4lb. fresh lime,  $\frac{3}{4}$ lb. of treacle and 60lb. of *tali*. As before the contents are again stirred daily for four days, at the end of which the lime and refuse are taken out of the water and thrown away; 60lb. of *tali*, 4lb. of lime and  $\frac{3}{4}$ lb. of treacle are again added to the *mát*, and stirred daily for four days as before. The sediment is again removed out of the vat as before. The same quantity of *tali* with 3lb. of lime and  $\frac{1}{2}$ lb. of treacle is added again and thoroughly stirred in. The liquid is again stirred twice daily for four days. The water now assumes a pale green colour. One lb. of indigo is then rubbed in a *nánd* with water and the paste strained with water through a piece of cloth into the *mát*. Two lb. of lime and  $\frac{1}{2}$ lb. of treacle are then thrown in. The contents of the *mát* are stirred with a stick twice a day for about four days. Four lb. of indigo is again rubbed into a fine paste, which is strained into the vat as before, and 4lb. of lime with  $\frac{1}{2}$ lb. of treacle added again and the contents stirred daily as before for four days.

At the end of this period if there be a reddish black froth on the water and if the water and the sediment be yellow, the *mát* is in a fit state for use. In a *mát* of the capacity described above the largest quantity of indigo that can be properly fermented is 6lb., but it is preferable to put in altogether not more than 5lb. With each dip of cloth or yarn into the vat the solution loses its strength until little colouring matter is left in it. To make up a fresh vat it is not necessary to repeat the elaborate processes above described. All that is required is to put into coloured liquid of the same *mát* about 5lb. of indigo previously rubbed in the usual manner together with 4lb. of lime and  $\frac{3}{4}$ lb. of treacle, and add fresh water to make up the quantity previously lost by evaporation and in the course of dyeing. The contents are of course stirred daily as before. There are vats now in existence in Lucknow which have been continually in use in the above manner for more than a century.

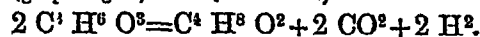
A series of interesting chemical changes, resulting ultimately in the production of nascent hydrogen, take place in course of preparing a fermentation vat by either of the native methods.

The gur (raw sugar) is converted into grape sugar and the latter into lactic acid. The lactic acid again breaks up into butyric acid, carbon dioxide and free hydrogen which, as stated before, is essential for the conversion of indigotin into the soluble compound "white indigo."

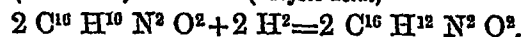
The various reactions may be represented by the following equations :—



(grape sugar.)                      (lactic acid.)



(lactic acid.)                      (butyric acid.)



(Indigotin)

(white Indigo.)

**Dyeing with Indigo.**—All simple shades of blue are obtained by dipping the material in the *mát*, the depth of colour depending upon the strength of the dye solution and the number of times the material is dipped. Should the solution be very strong it will not be possible to produce the light shades until its strength has been reduced by dyeing deeper shades with it. If, on the contrary, the solution is only of average strength, it will impart a light colour to the material dipped in it, which can be intensified by each subsequent dipping until the material ceases to absorb any more dye.

The lightest shade of blue dyed in indigo is known as *baizai* (light pale blue), to which the name has been applied on account of its resemblance with the egg (*baiza*) of a crow. It is produced only in Lucknow, and is practically unknown in other districts.

Other shades with successively increasing depth of colour are enumerated below:—

- (1) *Asmāni* (light blue).
- (2) *Abi* (sky blue).
- (3) *Gahra Abi*, (a shade of blue).
- (4) *Nila* (blue).
- (5) *Adhranga* (deep blue).
- (6) *Surmai* (dark blue) or navy blue.

All these are obtained from the *māt*, but, as already stated, the number of times the cloth should be dyed in the *māt* to produce each shade depends upon the strength of the solution in each individual vat.

Two more shades of blue are dyed with dye stuffs of mineral origin, and they are—

- (7) *Ferozai* (cobalt blue).

To dye a piece 3 yds. x 1½ yds., 2 oz. of copper sulphate is dissolved in water and the piece is immersed in the solution. Then 8 oz. of lime is mixed with and stirred up in a sufficient quantity of water, and the cloth is plunged in this mixture. Lastly it is dipped in plain water. These processes are repeated three times in the order in which they have been described; and the cloth then assumes the colour known as *Ferozai*.

- (8) *Zangari* (turquoise blue), (Lucknow).

To dye a piece similar to the above 2 oz. of fennel seed (*Feniculum vulgare*) is powdered and mixed with 1½ pint of water. The mixture is allowed to stand for a day. One oz. of gum acacia, 6 drs. of camphor, 8 oz. of verdigris and 3 oz. of sugar-candy are pounded and added to the fennel seed liquid to make a paste, which is ground fine in a pestle with addition of fresh water for about three days. The liquid thus prepared is of a somewhat thick consistency.

The cloth to be dyed is moistened with clear water. The liquid is then applied to it, and the cloth rubbed between the hands in order to distribute the colour evenly.

It is essential that the rubbing should be most regular.

**Section III. Red and its shades.**—Safflower is the chief native dye stuff concerned in the production of the red colour in all its shades.

The colour it gives is however fugitive, and no method has so far been discovered to make it permanent.

The safflower of commerce contains two different pigment principles, *viz.*, the safflower yellow which is soluble in water; and the red colouring matter carthamin,  $C^{14}H^{10}O^3$ , soluble in a dilute solution of sodium carbonate and other alkalis.

The yellow substance is first eliminated by the dyer in the following manner:—The flowers are reduced to a fine powder and placed on a cloth strainer (*dudra* or *aafi*) fastened to a wooden frame called *manjhi* or *tipai*. Cold water is then gently poured over the mass and allowed to filter through, carrying the yellow substance with it in solution. The yellow dye thus obtained is called *pewar*.

This process is continued till the filtrate is almost colourless. The mass on the strainer is then thoroughly rubbed between the hands with copious additions of water.

The filtrate now obtained is of a dirty reddish yellow colour and is called *hatttha*. When added to the *pewar* it can be used for dyeing a light crimson colour of an inferior quality.

The residue is then removed from the strainer, wrapped up in a piece of cloth and squeezed or trampled down with the feet, to get rid of the moisture as far as possible. It is then transferred to an earthen vessel (*nānd*) in which it is mixed with an alkali, generally the ashes of the stalks of some plant rich in potash, e.g., *chirchira* (*Achyranthes aspera*), *dhak* (*Butea frondosa*), tobacco (*Nicotiana tabacum*), *bājra* (*Penicillaria spicata*), *kela* (*Musa sapientum*) or the ashes of an unripe jack fruit, or the mineral substance known as *sajji* (crude carbonate of soda). The quantity of alkali used varies from one to three ounces for every pound of flowers. The mixture is then trampled down with the feet, or rubbed with the hand for an hour, to form a sort of paste. The latter is made into a ball of a more or less conical shape, which is placed on a cloth strainer and water poured on it in a very gentle stream, which carries occasionally the red colour down in solution.

The strongest tincture extracted first, which is of a deep crimson colour, is called "*jetha rang*" or *sire ka rang*. By pouring more water over the flower paste on the strainer tinctures of three successively decreasing strengths are obtained and collected separately. They are technically called (a) *manjhlā*, which is weaker than the "*jetha rang*," (b) *pasawa*, which is weaker than *manjhlā*, and (c) *kat*, which is the weakest of all. These various tinctures are employed for producing various shades of red, the stronger ones for the deeper and the weaker for the lighter shades.

As a rule the *jetha rang* is used for producing rose, the *manjhlā* for rose pink and the *pasawa* for light pink. When a bath is prepared from the strong tincture (*jetha rang*) for dyeing a deep shade, and the cloth has been dyed in that shade, the dyer usually utilises the colouring matter that may be left in the bath by dipping another piece in it to dye a light shade of pink. Should the latter turn out to be of a poor quality the piece is plunged in a bath of some yellow or blue dye to produce a compound shade of sufficient brilliancy.

In this way the dyer makes the fullest use of the traces of the colouring principle in each bath. It is however not the rule always to use the *jetha rang* in its original form for dyeing.

Very frequently the "*rang*" is converted into a well-known substance named "*shahab*," which the professional dyer generally retails to amateurs, but also occasionally makes use of in his own business.

"Shahab" is prepared by treating the "*jetha rang*" (an alkaline liquid) with a small quantity of an infusion of mango rind or with tamarind water, stirring it in with the hand, and allowing the liquid to stand for a few hours. The acid wholly or partially destroys the alkalinity of the dye solution, causing a slight effervescence in the liquid, and the carthamin originally dissolved by the alkali is therefore precipitated.

The surface liquid, which still contains a weak solution of carthamin, and is called *nitharan*, is then gently decanted off and used for dyeing the lighter shades.

The turbid liquid of the lower strata containing the precipitate in a very fine state of division is transferred to another vessel, and the name "*shahab*" is then applied to it.

"Shahab" may therefore be treated as a liquid holding carthamin partly in solution, but chiefly in suspension.

In an experiment made by the compiler with the aid of a professional expert of Lucknow the following products were obtained from 2 lb. of safflower:—

(1) <i>Jetha rang</i> (tincture of the 1st straining)	... 140 oz.
(2) <i>Manjhla</i> (tincture of the 2nd straining)	... 90 oz.
(3) <i>Pasawa</i> (tincture of the 3rd straining)	... 150 oz.
(4) <i>Kat</i> (tincture of the 4th straining)	... 360 oz.

The *jetha rang* was all converted into "*shahab*," having been mixed with 16 oz. of mango rind infusion ( $\frac{1}{2}$  lb. of the rind to  $\frac{1}{2}$  gallon of water), and yielded 24 oz. of *shahab*.

Forty ounces of the *manjhla* were found to be sufficient to dye rose pink a piece of  $4\frac{1}{2}$  sq. yds.; and 9 sq. yds. were dyed flesh pink with the above quantity of the *kat*.

These various tinctures are, however, always of more or less indefinite strength, and it is therefore impossible to state with anything like accuracy the quantity required for producing each shade on a piece of given length and breadth, but figures denoting such quantities in the case of dyeing with "*shahab*," carried on under the compiler's personal supervision, are available, and will be quoted in the following paragraph.

#### *Dyeing with Shahab.*

The different shades of red are obtained by dipping the cloth in baths of varying strength prepared with various quantities of *shahab* added to water.

The lightest shade of red dyed in Lucknow is known as *motia*, and is produced (always on very fine cloth) in the following manner:—

To dye a piece of fine muslin 3 yds.  $\times$   $1\frac{1}{2}$  yds.—

The cloth is first made wet. It is then dipped in a bath made up of  $\frac{1}{2}$  dram of *shahab* and 40 oz. of water and wrung out. The bath is then acidified by adding three drams of an infusion of mango rind and the cloth plunged into it, taken out and squeezed. It is then rinsed separately with water similarly acidulated and squeezed.

The starch paste is then dissolved in acidulated water, and the cloth immersed in it, taken out, squeezed and dried in the shade. Dyer's charge=1 anna.

Other shades of red with successively increasing depth of colour are obtained only by varying the quantity of "*shahab*" and acid in the bath in the following proportions, the process of dyeing remaining unchanged:—

(1) For *piazi* (flesh pink)—

<i>Shahab</i>	...	...	...	1 dram.
Acid infusion	...	...	...	$\frac{1}{2}$ oz.
Dyer's charge	—1 anna.			

(2) *Phul gulabi* (pink)—

<i>Shahab</i>	...	...	...	5 drams.
Acid infusion	...	...	...	6 drams.
Dyer's charge	—1 anna.			

(3) *Gakra gulabi* or *sher gulabi* (rose pink)—

<i>Shahab</i>	...	...	...	15 drams.
Acid infusion	...	...	...	1 oz.
Dyer's charge	—2 annas.			



(4) *Gul-i-shaftalu* (rose).

<i>Shahab</i>	...	...	...	...	8 oz.
Acid infusion	...	...	...	...	7 oz.
Dyer's charge—8 annas.					

Note.—Strength of the acid infusion= $\frac{1}{2}$  lb. of mango rind to  $\frac{1}{2}$  gallon of water.

Colours—all fleeting.

Two simple shades of red, both of which are fast, are obtained from mineral dyes, viz., cinnabar and red ochre, and they are :—

(a). *Shanjarfi* (salmon). Piece—3 yds.  $\times$   $1\frac{1}{2}$  yd.

Six drams of *shanjarfi* are rubbed in water for about four days to make up the bath and the piece dyed in it in the usual way.

(b) *Gerua* or *jogia* (buff).

Red ochre is rubbed in sufficient water to make up a bath and the cloth dipped in it, squeezed and dried.

The *gerua* (buff) of Mainpuri and Allahabad—

Piece dipped—

(a) in red ochre.

(b) in alum solution.

Section IV. Yellow and its shades.—The yellow colour is obtained chiefly from four dye substances of vegetable origin, viz.:—

(a) Turmeric.

(b) Flowers of *Harsinghar* (*Nyctanthus arborescens*).

(c) Flowers of *Tesu* (*Butea frondosa*).

(d) Flowers of *Tin* (*Cedrela toona*).

The colours they produce are all of a fleeting character; but according to Sir Edward Buck the use of pomegranate rind and alum, as mordants tends to give a permanency to the yellow colour yielded by turmeric. The dyers of Lucknow, however, say that this plan would render the colour only partially fast. Of the four dye substances enumerated above turmeric is in the most common use.

For use in dyeing turmeric has to be ground on a slab into a fine paste and the paste dissolved in water.

Harsinghar flowers have to be steeped for an hour in plain water, which is warmed in the cold season, in order to facilitate the elimination of the colouring matter.

The flowers of *Butea frondosa* are steeped in cold water which is rendered slightly alkaline by the addition of a small quantity of lime.

From the flowers of *tin* (*Cedrela toona*) the yellow dye is extracted by boiling them in water till three-fourths of the latter are evaporated.

The lightest standard shade of yellow is known as *kapasi* \* (canary or pale yellow). It is obtained as follows :—

Piece of cloth—3 yds.  $\times$   $1\frac{1}{2}$  yd. :—

(a) An infusion is prepared by steeping in an earthen vessel  $\frac{1}{2}$  lb. of flowers of *Butea frondosa* in  $\frac{1}{2}$  gallon of water, to which 4 drams of lime are added and the vessel kept in the sun for two hours.

\*A still lighter shade called *chaitia* is occasionally produced in Lucknow by dipping the cloth in a very weak bath of *tesu* infusion and then in slightly acid water, but it is of so fleeting a character as to be hardly recognised as a shade.

(b) The cloth, previously moistened with water and wrung out, is plunged in a bath containing 40 oz. of the infusion and wrung out.

(c) A quarter of a dram of turmeric is then dissolved in the bath and the cloth again plunged in it and squeezed.

(d) The cloth is rinsed with water and squeezed.

(e) It is dipped in a bath made up of 8 oz. of water and 3 oz. of an infusion of mango rind.

NOTE.—The infusion is prepared by steeping half a pound of rind in a quart of water.

(f) Two oz. of starch paste is dissolved in the last mentioned bath and the cloth immersed in it.

(g) It is wrung out and dried in the shade.

Dyer's charge in Lucknow—1 anna.

A kind of *kapasi* resembling yellow buff is dyed in Mainpuri by dipping the cloth first in an infusion of *harsinghar* flowers and then in acidulated water. The colour produced is fleeting. (Buck.)

The next higher shade of yellow is *amaltasia* (light chrome yellow) and is produced in the following manner:—

Piece—3 yds.  $\times$   $1\frac{1}{2}$  yd.—

(1) Dipped in a solution of  $1\frac{1}{2}$  oz. of turmeric in 30 to 40 oz. of water.

(2) Washed.

(3) Dipped in a bath made up of 6 oz. of mango infusion of the same strength as given under *kapasi* and a pint of water.

(4) Starched, squeezed and dried as in the case of *kapasi*.

Dyer's charge—1 anna.

Another simple shade of a deeper yellow colour goes by the name of *basanti* (lemon yellow) and is dyed as follows:—

(1) Cloth dipped in a bath made up by dissolving  $1\frac{1}{2}$  oz. of turmeric in 30 oz. of water.

(2) Ten grains of lime added to the bath and the cloth dipped in again.

(3) Washed.

(4) Plunged in water acidulated with 6 oz. of mango rind infusion.

(5) Starched, squeezed and dried. Dyer's charge (Lucknow)—1 anna.

Sir Edward Buck says that cloth simply dipped in an infusion of *tén* flowers takes the yellow fleeting colour known as *basanti*.

The *basanti* as dyed in Cawnpore is slightly different, being similar to the English sulphur yellow, and is produced by dipping the cloth in a bath made up by dissolving 2 oz. of turmeric in a decoction of 4 oz. of *tén* flowers. Two oz. of lime is then added to the bath and the cloth dipped again, wrung out and immersed in acidulated water, squeezed and dried.

Dyer's charge—3 annas. (Buck.)

*Zard* (yellow).—In the majority of districts this colour is produced by the following processes:—

(a) 1.—Cloth ( $2\frac{1}{2}$  yds.  $\times$   $1\frac{1}{2}$  yd.) dipped in a solution of 3 oz. of turmeric in 40 oz. of water.

2.—Immersed in acidulated water.

In Hardoi.—(1) Dipped in a decoction of *harsinghar* and (2) dipped in alum solution.

In Aligarh.—(1) Dipped in a solution of 2 oz. of turmeric and (2) dipped in a solution of 1 oz. of alum.

The colour is fleeting, but according to Sir E. C. Buck it can be made fast by dipping the cloth so dyed in a decoction of pomegranate rind and again washing it in alum water.

(b) The following recipe for this shade from Hafiz Yakub Khan of Khurja is mentioned in the *Namu-us-Sabbaghin*, a Persian work on dyeing:—

*Piece of cloth*—2 square yards.

1.—Dipped in a solution of 3 oz. of turmeric.

2.—Dipped in a solution of 7 drams of alum.

3.—Dipped in a decoction prepared by boiling 1 lb. of mango bark in half a gallon of water.

A shade of yellow called *hartali* (sulphur yellow) is dyed in Muzaffarnagar in the following manner:—

The material is first dipped into a carefully made solution of turmeric (2 oz. to 16 oz. of water) and then into a second solution of 1 oz. of alum and 6 drams of yellow orpiment in 16 oz. of water. Colour fleeting. Dyer's charge—1 anna.

The *hartali* of Agra is dyed by immersing the piece—

(a) in an infusion of *harsinghar* flowers,

(b) in an infusion of turmeric,

(c) in a solution of alum.

The shade, produced by dipping a piece of cloth  $4\frac{1}{2}$  square yards in an infusion of  $\frac{1}{2}$  lb. of dried *harsinghar* flowers, then in acidulated water, is known in Lucknow as *chandani*. Dyer's charge—2 annas.

A fast shade of yellow called *gendai* (marigold yellow) is obtained by steeping a piece of cloth in a strong decoction of the flowers of *genda* (*Tagetes erecta*), and then in an alum bath. About 5 lb. of flowers are sufficient to dye  $4\frac{1}{2}$  square yards. This dye is but little used by dyers, though not unfrequently by the common people.

A simple shade of yellow known in Lucknow and Gorakhpur as *matiala* (ochre yellow) is dyed by soaking the cloth in an infusion of *Multani matti*.

**Section V. Grey and Drab.**—A series of shades of grey and drab are commonly produced through the agency of the chebulic myrobalan (*harra*) and green vitriol (*kasis*). The rind of myrobalan contains a kind of tannin known as ellagitannic acid,  $C^{11}H^{10}O^{10}$ , which, in general, strongly resembles tannic acid, and gives, with ferrous salts, a white gelatinous precipitate which becomes dark blue in contact with the air, and with ferric salts a bluish black precipitate of ferric tannate or "ink." To this property is entirely due the use of the *harra* fruit as a mordant for dye stuffs, containing oxides of iron. As a rule the cloth is dipped first in an infusion of myrobalan and dried in the sun. It is then immersed in a solution of sulphate of iron, the strength of the infusion and the solution depending upon the depth of the colour of each shade.

Even application of myrobalan to the cloth is essential, otherwise the subsequent dyeing with iron solution will occasion spots.

The chief shades thus produced are:—

(a) *Gul-i-sarrai* or *Sarkandai*.—Silver grey.

(b) *Dudhia khaki*.—Light slate or French grey.

(c) *Khaki* or *jastai*.—Grey.

(d) *Kathia khaki*.—Slate drab.

(e) *Dudhia kanjai*.—Pearl grey.

(f) *Fakhtai*.—Dove grey or stone drab.

(g) *Kanjai*.—Smoke or ash drab.

The first three do not appear to be standard shades. The shade known by the name (a) in one district goes by the name (b) or (c) in another and *vice versa*.

In Lucknow these three shades are distinctly deeper than in many other districts.

Again the *fakhtai* or *khaki* of one district is identical with *kanjai* of another and so on.

Two dyers from different districts will therefore hardly identify one of these shades with the same name.

The Lucknow methods for dyeing the more important of these shades have been actually tried by the compiler and are given below:—

(1) The rind of myrobalan is ground into a paste with a little water.

(2) A solution of green vitriol is prepared by dissolving four drams of ferrous sulphate in four ounces of water.

(3) An acid infusion is made up as follows:—

Mango rind or tamarind  $\frac{1}{2}$  lb.

Water  $\frac{1}{2}$  gallon.

Steeped for 3 to 6 hours.

Dyeing—

(a) *Gul-i-sarrai*.—Piece of cloth 1 square yard.

(1) Dipped in an infusion of three drams of myrobalan.

(2) Dipped in 2 drams of ferrous sulphate solution diluted with enough water.

(3) In water acidulated with 2 oz. of the acid infusion.

Dyer's charge—1 anna.

(b) *Dudhia khaki*.—Piece 1 square yard.

Processes same as in *gul sarrai*, only acid is not used.

Dyer's charge—9 pies.

(c) *Kathia khaki*.—Piece 1 square yard.

(1) Myrobalan 9 drams.

(2) Ferrous sulphate solution 4 ounces.

Dyer's charge—9 pies.

Note.—If cloth dyed *kathia khaki* and dried be dipped in a decoction of 4 oz. of pomegranate rind in which six drams of alum is dissolved, it will assume the colour known as *lobia kanjai* (greenish dark).  
Dyer's charge— $1\frac{1}{2}$  annas.

(d) *Fakhtai*.—Piece 1 square yard.

(1) Myrobalan two drams.

(2) Fe. S.O<sup>4</sup>. solution 3 drams.

(3) Lime six grains dissolved in bath (2).

Dyer's charge—1 anna.

The remaining shades are obtained similarly by varying the relative proportions of the two ingredients with which they are produced.

Note.—All these shades can also be produced by substituting *Kath* or "Iron liquor" described in detail in section VIII of this chapter.

**Section VI. Compounds of Blue and Red.**—These two colours are combined in various proportions in order to produce the different shades of purple, violet, lilac, heliotrope and lavender. The blue dye, used for the production of the lighter shades, is usually a simple infusion of indigo, prepared by rubbing the "*pakka*"

or "*gatti*" indigo in an earthen vessel with water as fine as possible, the common proportion being 2 drams of indigo to 6 oz. of water.

In the description of dyeing methods which will follow presently the term "indigo liquor" will be used for this infusion. Chinese blue is freely substituted now-a-days for the native indigo, as the former produces brighter and more even shades.

To obtain shades containing increased depths of blue it is however the practice to dip the material in the fermentation vat before it is immersed in the red dye-liquid.

The native red dye used for the various compound shades of a fleeting nature is invariably the "*shahab*" obtained from safflower, but for the permanent shades it may be *majit* (the Indian madder) or *patang* (sappan wood). In practice, however, the European magenta crystals are now largely used in place of safflower.

An acid preparation, commonly an infusion prepared by steeping  $\frac{1}{2}$  lb. of mango rind in  $\frac{1}{2}$  gallon of water, is used, as a rule, for brightening the colour of each shade.

The following is a description of the methods of dyeing the various shades belonging to this class of compound colours:—

(1) *Khashkhashi*, *Badshah pasand* or *Dilbahar*.—Light lavender (Lucknow), Piece 3 yds.  $\times$   $1\frac{1}{2}$  yd.

(a) Dipped in 1 dram of "*shahab*" diluted with enough water to make up a bath.

(b) Three times in an indigo bath,  $\frac{1}{2}$  dram of indigo liquor being put into the bath before each dip.

(c) In a bath containing six drams of acid. Dyer's charge 2 annas.

The *Khashkhashi* of Aligarh and Sitapur is obtained by dipping the cloth in—

(a) 1 dram of myrabolan infused in water,

(b)  $1\frac{1}{2}$  dram of *shahab* freely diluted with water,

(c) water acidified with  $1\frac{1}{2}$  oz. of mango infusion.

(2) *Kokai* or *Kauriyala*.—Lavender (Lucknow). Same process as in the case of the *Khashkhashi* of Lucknow, but the quantity of indigo liquor used is raised to 3 drams of the acid infusion to 2 oz., the indigo liquor being used in four instalments as before. Dyer's charge 2 annas.

To produce fast *kokai* (mauve) the piece is first dyed red by boiling with 6 oz. of *majit* and 1 oz. of alum and then dipped in the indigo vat.

(3.) *Kasni* (*heliotrope*)—(Lucknow). Piece 3 yds.  $\times$   $1\frac{1}{2}$  yd., dipped in—

(a) a bath containing 2 drams of *shahab*,

(b) a bath containing 12 drams of indigo liquor,

(c) a bath containing 1 oz. of acid infusion. Dyer's charge 2 annas.

(4) *Abbasi* or *Gul-e-Abbasi*.—Magenta (Lucknow). Dipped in a bath containing—

(a) 8 oz. of *shahab*,

(b) 1 oz. of mango acid added to the same bath.

(c)  $2\frac{1}{2}$  drams of indigo liquor.

By using slightly increased quantities of indigo liquor four more shades are obtained namely:—

(5) *Karaundia*—(Puce).

(6) *Kirmizi*—(Light crimson).

(7) *Abiri*.—(Crimson).

(8) *Sausani*—(Mauve).

The remaining shades characterised by a predominance of blue are produced according to the methods noted in the following table, the piece of cloth being 3 yds.  $\times$  1½ yd.:—

Vernacular name of the shades with their English equivalents.	1st dip.	2nd dip.	3rd dip.	Dyer's charge.	Remarks.
	In the indigo māt to dye.	Red dye used.	Acid infusion or alum.		
(9) <i>Nāfarmāni</i> —(Pompadour purple).	<i>Halka as-māni</i> (Pale blue).	<i>Jetka rang</i> or the red safflower tincture of the 1st straining 40 oz.	Acid infusion 2 oz.	Rs. a. p. 0 4 0	In practice the red dye used for the production of these colours is invariably the " <i>rang</i> " and not <i>shahab</i> , which somehow does not give satisfactory results. The quantity of <i>rang</i> used varying according to strength of the tincture. The figures in this statement denote the weight used of a tincture of average strength.
(10) <i>Falsāi</i> .—(Dahlia)...	<i>Asmāni</i> . (Light blue).	<i>Jetka rang</i> or red safflower tincture of the 1st straining 40 oz.	Acid infusion 2 oz.	0 4 0	
(11) <i>Udd</i> .—(Violet) ...	<i>Gakra ṣ-māni</i> (Light sky-blue).	<i>Jetka rang</i> or red safflower tincture of the 1st straining 40 oz.	Acid infusion 2 oz.	0 4 0	
(12) <i>Baigani</i> .—(Pansy)...	<i>Abi</i> (Sky-blue).	<i>Jetka rang</i> or red safflower tincture of the 1st straining 50 oz.	Acid infusion 3 oz.	0 4 0	
(13) <i>Bainjani</i> or <i>Jamuni</i> (Purple).	<i>Gakra Abi</i> (Blue).	<i>Jetka rang</i> or red safflower tincture of the 1st straining 80 oz.	Acid infusion 4 oz.	0 4 0	
(14) <i>Surkhīdar</i> * <i>Surmai</i> (Regal purple).	<i>Surmai</i> (Deep blue).	*50 oz. of decoction of sappan wood.	Solution of ½ oz. of alum.	0 4 0	
(15) <i>Tausi</i> .—(Dark purple).	(Dark blue)	80 oz. of a decoction of sappan wood.	Solution of ½ oz. of alum.	0 6 0	

\* ½ lb. of sappan wood boiled with enough water to yield ½ gallon of the decoction.

**Section VII. Compounds of Yellow and Red.**—The different shades of this class are produced by dipping the material successively in—

(a) the solution of a yellow dye,

(b) *shahab*,

(c) acidulated water.

The yellow dye may be *tūr*, turmeric or *harsinghar*. In practice however *tūr* is generally used for the lighter and turmeric for deeper shades. *Harsinghar* is only sparingly used on account of being costly. The turmeric is generally powdered and ground into a paste with a little water. In the case of *tūr* flowers a decoction is prepared by boiling 4 oz. of flowers in 60 oz. of water until the quantity of water is reduced to 40 oz.

The preparation of *shahab* has already been described in the section on red and its shades.

An acid is prepared by infusing  $\frac{1}{2}$  lb. of mango rind in  $\frac{1}{2}$  gallon of water for a few hours. The shades enumerated in the following table are obtained by dyeing with varying quantities of the above preparations, the cloth in each case being 3 yds.  $\times$   $1\frac{1}{2}$  yd. :—

Vernacular names of shades with their English equivalents.	1st dip.	2nd dip.	3rd dip.	Dyer's charge.	Remarks.
	Yellow dye.	Red dye.	Acid infusion.		
(1) <i>Keorai</i> —(Yellow tinted white). Lit. resembling the flower of Keora ( <i>Pandanus odoratissimus</i> ).	Decoction of flowers of tun ( <i>cedrela toona</i> ) 2 oz.	<i>Shahab</i> 3 drops	$1\frac{1}{2}$ oz.	Rs. a. p. 0 1 0	
(2) <i>Kafuri</i> .—(Straw) ...	Do do.	Do. 5 do.	Do.	0 1 0	
(3) <i>Sharbati</i> .—(Light buff).	Decoction of flowers of tun ( <i>cedrela toona</i> ) $1\frac{1}{2}$ oz.	Do. 10 do.	2 oz.	0 1 0	
(4) <i>Bádami</i> .—(Yellow buff).	Do. 4 oz.	Do. 12 do.	Do.	0 1 0	
(5) <i>Chamelia</i> or <i>Záfráni</i> (Golden yellow).	Do. 6 oz.	Do. 16 do.	Do.	0 2 0	
(6) <i>Champai</i> .—(Saffron yellow).	Do. $7\frac{1}{2}$ oz.	Do. 16 do.	Do.	0 2 0	
(7) <i>Shanjari</i> or <i>Shingrafi</i> .—(Light vermilion).	Do. 7 oz.	Do. $2\frac{1}{2}$ oz.	1 oz.	0 4 0	For <i>shanjari</i> the cloth is first dipped in <i>shahab</i> and then in <i>tún</i> decoction.
(8) <i>Sonahra</i> or <i>Amrasi</i> (Orange yellow).	Infusion of 2 oz. of turmeric to which 20 grains of lime is added.	<i>Shahab</i> 2 oz. mixed with 20 oz. of decoction of tun flowers.	2 oz.	0 2 0	In this case the cloth has to be soaked in the yellow dye for one hour in order that the colouring matter may be fully absorbed by it.
(9) <i>Naranji</i> .—(Orange) ...	Infusion of 1 oz. of turmeric.	<i>Shahab</i> 4 oz.	Do.	0 4 0	Do. do.
(10) <i>Kaulai</i> .—(Blood orange or orange red).	Do.	6 oz.	Do.	0 4 0	
(11) <i>Suha</i> .—(Red) ...	Infusion of turmeric 3 drams.	<i>Shahab</i> 8 oz.	2 oz.	0 4 0	
(12) <i>Gule anar</i> .—(Scarlet)	Do. $1\frac{1}{2}$ oz.	8 oz.	Do.	0 4 0	In this case the cloth is usually washed with clear water after the 1st dip.
(13) <i>Gulnar</i> .—(Turkey red).	Do. $\frac{1}{2}$ oz.	12 oz.	Do.	0 8 0	
(14) <i>Atshi</i> .—(Deep red)	Turmeric $\frac{1}{4}$ oz.	<i>Jetharang</i> (Red safflower tincture of the 1st straining) 40 oz. to 50 oz., <i>Shahab</i> 10 oz.	8 to 10 oz.	2 0 0	The bath is prepared by mixing the infusion of turmeric with the safflower tincture and dipping the cloth alternately in this bath, and a bath containing acidulated water until the colouring matter is all taken up by the cloth. This generally takes place after five or six dips. Lastly a bath is made up with the 10 oz. of <i>shahab</i> , into which the cloth is dyed until it has acquired the desired shade.

*N.B.*—In practice *Kaulai* and the shades requiring use, in greater quantity, of the red dye, are generally not dyed with *shahab*, but with the *jetha rang* or the red tincture of the 1st straining, which is used in quantities corresponding with those of *shahab* given in the above table.

**Section VIII. Compounds of Yellow and Blue.**—In ordinary practice the yellow dyes used for the production of these colours are flowers of *Butea frondosa* (*tesu*) and turmeric. The former are infused in alkaline water (generally in proportion of  $\frac{1}{2}$  lb. of flowers to  $\frac{1}{2}$  gallon of water to which a few grains of lime are added) and the turmeric is ground into a fine paste. The blue dye used is the infusion of indigo mentioned under "Compounds of Red and Blue," viz., 3 drams of *pakka* indigo rubbed in 6 oz. Chinese blue however gives better tone and more brilliancy to the colour and is preferred to the native indigo. An acid infusion is also employed in order to brighten the colors.

The various colours of this class and the methods of producing them are noted in the following statement, the piece to be dyed in each case being 3 yds.  $\times$   $1\frac{1}{2}$  yd. :—

Vernacular names of shades with their English equivalents.	1st dip.	2nd dip.	3rd dip.	Dyer's charge.	Remarks.
	Yellow dye.	Blue dye.	Acid infusion.		
(1) <i>Gandhaki</i> (Pale yellow).	Infusion of <i>tesu</i> (flowers of <i>Butea frondosa</i> ) 40 oz. Turmeric 15 grains.	Indigo liquor 10 drops.	Mango rind infusion 4 oz.	0 1 0	The turmeric is dissolved in the <i>tesu</i> infusion.
(2) <i>Anguri</i> (Light canary).	Infusion of <i>tesu</i> 40 oz., Turmeric 30 grains.	Indigo liquor 15 drops.	Ditto.	0 2 0	Ditto.
(3) <i>Bardai</i> (Light pea green).	Infusion of <i>tesu</i> 20 oz., Turmeric 1 dram.	Indigo liquor $2\frac{1}{2}$ drams.	Ditto.	0 1 0	Ditto and the indigo liquor is added to the 2nd bath in 2 instalments, the cloth being dipped in it after each addition of the liquor.
(4) <i>Gannai</i> or <i>Paundai</i> (Sap green).	Infusion of <i>tesu</i> 20 oz., Turmeric $1\frac{1}{2}$ dram.	Indigo liquor 3 drams.	Ditto.	0 1 0	The liquor is added in 3 instalments, and the cloth dipped as in the preceding case.
(5) <i>Semai</i> (Light green).	Infusion of <i>tesu</i> 40 oz.	Indigo liquor $3\frac{1}{2}$ drams.	Ditto.	0 1 0	Ditto.
(6) <i>Pistai</i> (Pea green)...	Turmeric 2 oz.	Indigo liquor 4 drams.	Mango rind infusion 5 oz.	0 2 0	The cloth is washed after the first dip and the indigo liquor added to the bath in four instalments.
(7) <i>Dhani</i> or <i>Totai</i> (parrot green).	Turmeric 1 oz.	Indigo liquor 1 oz.	Mango rind infusion 6 oz.	0 1 0	Ditto.
(8) <i>Sabz mungia</i> , a shade of green resembling the ripe grain of <i>mung</i> ( <i>Phaseolus mungo</i> ). The English colour near to it is light sage.	Turmeric $1\frac{1}{2}$ oz.	Indigo liquor $1\frac{1}{2}$ oz.	Ditto	0 2 0	Ditto



*Shades of green in the production of which dyeing in indigo vat is essential.*

The shades mentioned in the foregoing table are of a fleeting nature. There is a series of more or less permanent shades of green in most of which fermented indigo, myrobalan and acetate of iron form the chief component parts. The acetate of iron is prepared in the following manner:—Raw sugar or treacle is dissolved in water in a large earthen vessel (in the proportion of 1 lb. of sugar to 4 gallons of water). Some scrap iron is thrown into it and the liquid kept (if possible in the sun) for a few days to ferment. In the course of fermentation a froth or scum gradually accumulates on the surface, and when this acquires a dark brown colour the preparation is supposed to be fit for use. It is technically known as *Kath*, *Kaserhe ki siyahi*, or *Lohe ki siyahi*. Hereafter it will be referred to as "iron liquor."

More sugar and water are added at intervals in order to keep up a ready supply of this liquid, the crude acetic acid resulting from the decomposition of sugar being allowed to stand upon the iron until it has dissolved all the iron that it is capable of taking up.

The chief shades of fast green and the methods of producing them are described below:—

(1) *Sabz or sabz dhani* (green). Piece 3 yds.  $\times$  1½ yd.

Dipped—

(a) in *mât* to dye *âsmâni* (light blue),

(b) soaked in an infusion of 2 oz. of turmeric,

(c) in 40 oz. of yellow tincture of safflower (*pewar*) or in a solution of 1 oz. of alum or in 4 ozs. of mango rind or tamarind water. Dyer's charge 1 auna.

(2) *Sabz kahi* (myrtle green). Piece of cloth 3 yds.  $\times$  1½ yd.

Dipped—

(a) in *mât* to dye *adhranga* (deep blue),

(b) in an infusion of 2 oz. of turmeric,

(c) in an infusion of 2 oz. of myrobalan,

(d) in iron liquor, 16 oz,

(e) in a decoction of 4 oz. of pomegranate rind with 1 oz. of alum, or (2) a decoction of leaves of *rusa* (*Adhatoda vasica*), or (3) 15 oz. of yellow tincture of safflower (*pewar*).

Dyer's charge 4 annas.

(3) *Zamurradi* (peacock green). Piece 3 yds.  $\times$  1½ yd.

Dipped—

(a) in *mât* to give it a deep blue shade,

(b) in an infusion of 4 oz. of turmeric, soaked in it for three hours, squeezed and washed,

(c) in 40 oz. of yellow tincture of safflower (*pewar*), or in a decoction of 4 oz. of *naspal* and 1 oz. of alum, or in a decoction of the leaves of *Adhatoda vasica* (*rusa*).

Dyer's charge 4 annas.

*Zamurradi of Cawnpore* (dark green). Piece 2½ yds.  $\times$  1½ yd.

Dipped—

(a) in an infusion of 2 oz. of myrobalan,

(b) in a solution of 2 oz. of sulphate of iron,

- (c) in an infusion of 2 oz. of turmeric,  
 (d) in a decoction of 3 oz. of pomegranate rind,  
 (e) in alum solution,  
 (f) in acidulated water. (Buck.)  
 (4) *Mashi* (light grass green) of Cawnpore. Piece  $2\frac{1}{2}$  yds.  $\times$   $1\frac{1}{2}$  yd.

Dipped—

- (a) in an infusion of 2 oz. of myrobalan,  
 (b) in a solution of 2 oz. of sulphate of iron,  
 (c) in an infusion of 2 oz. of turmeric,  
 (d) in a decoction of 2 oz. of pomegranate rind,  
 (e) in a solution of 2 oz. of alum. Colour fast. (Buck.)  
 (5) *Tarbuzia* or *botli* (bottle green). Piece 3 yds.  $\times$   $1\frac{1}{2}$  yd.

Dipped—

- (a) in māt to give it a light blue shade,  
 (b) in an infusion of 2 oz. of turmeric,  
 (c) in an infusion of 2 oz. of myrobalan,  
 (d) in 16 oz. of iron liquor.

Dyer's charge 4 annas.

- (6) *Telia mashi* (olive green). Piece 3 yds.  $\times$   $1\frac{1}{2}$  yd.

Dipped—

- (a) in māt to give it a light blue shade,  
 (b) in an infusion of 2 oz. of turmeric,  
 (c) in an infusion of 2 oz. of myrobalan,  
 (d) in 40 oz. of iron liquor.

Dyer's charge 4 annas.

- Telia mashi* of (Muzaffarnagar). Piece  $2\frac{1}{2}$  yds.  $\times$   $1\frac{1}{2}$  yd.

Dipped—

- (a) in 2 oz. of myrobalan,  
 (b) in an infusion of 4 oz. of turmeric,  
 (c) in a solution of 4 oz. of sulphate of iron,  
 (d) in an infusion of 8 oz. of pomegranate rind.

Section IX. Compound Greys.—*Tusi* (Slate). Piece of cloth 3 yds.  $\times$   $1\frac{1}{2}$  yd.  
 Dipped—

- (a) in an infusion of myrobalan and dyed in iron liquor (*kath*),  
 (b) in a bath made up with 3 drams of catechu and 3 drams of lime well stirred in a sufficient quantity of water.

A kind of *tusi* is obtained by dipping the cloth after it has been dyed with iron liquor in the above manner into a decoction of sappan wood (2 oz. to  $\frac{1}{2}$  gallon of water).

This shade has a reddish tinge in it.

Dyer's charge in both cases 2 annas.

*Fakhtai* (dove grey) of Cawnpore is dyed as follows :—

Piece  $2\frac{1}{2}$   $\times$   $1\frac{1}{2}$  yd.

The cloth is dipped—

- (a) in an infusion of myrobalan,
- (b) in sulphate of iron,
- (c) in alum solution,
- (d) in a solution of red ochre.

Dyer's charge 2 annas 6 pies. (Buck.)

*Pistai* (grey of Meerut).—Piece  $2\frac{1}{2} \times 1\frac{1}{2}$  yd.

Dipped—

- (a) in *mât*,
- (b) in a solution of alum.
- (c) in an infusion of *mājuphāl* (*Quercus infectoria*). Colour fast. Dyer's charge 2 annas.

*Shikari* (olive grey).—Piece 3 yd.  $\times 1\frac{1}{2}$  yd.

Dipped—

- (a) in an infusion of 2 oz. of myrobalan,
- (b) in 16 oz. of *kath* (iron liquor),
- (c) in an infusion of 2 oz. of turmeric,
- (d) in a decoction of 4 oz. of pomegranate rind.

Dyer's charge 2 annas.

**Section X. Black colours.**—The substance which plays the most important part in the production of black colour is "*kath*" or iron liquor. The method of preparing it has been described fully under section VIII.

Method of dyeing black (*siyah-bhura* or *kala*).—Piece 1 square yard.

*Processes*—

- (1) Dipped in a bath made up of a concentrated decoction of 2 oz. of myrobalan (*kali har*) and dried in the sun.
- (2) Dipped in a bath containing 40 oz. of iron liquor and dried in the sun.
- (3) Dipped again in bath No. (1) and dried.
- (4) Dipped in a bath No. (2) and dried.
- (5) Process (3) and (4) repeated. Colour quite fast.

Dyer's charge 1 to 2 annas.

*Compounds of black*—

If the piece dyed black as above be dipped in a solution of  $1\frac{1}{2}$  drams of alum and then in—

- (a) a bath containing 5 oz. of \*decoction of sappan wood, the shade produced will be *abnusi* (literally ebony black);
- (b) a bath containing 10 oz. of decoction of sappan wood, the shade obtained will be *sampia* (literally snake black);
- (c) a bath containing 40 oz. of decoction of sappan wood, the colour imparted will be called *kathia kakrezi* (very dark plum).

To dye black blue (*kala* or *siyah*) the piece is first dipped in the *mât* to give it a blue shade, then in a decoction of myrobalan (*kali har*), and then four times in iron liquor, the cloth being dried in the sun after each dip.

A shade of black colour called *bhura* or *babura* is very commonly dyed by the poorer classes of people by dipping the cloth in a decoction of the bark of

\* Strength  $\frac{1}{2}$  lb. to 2½ gallons of water boiled till one gallon is evaporated.

*babul* (*Acacia arabica*) and then trampling it under foot on the bottom soil of a tank, in which the *narai* grass, so common in village pools, may be growing. The black colour is apparently produced by the action of the iron and alumina of the clay soil and of the sap of the grass on the tannin.

*Siyah tab* (jet black).—Farukhabad.—Piece 20 yards.

The cloth is first bleached in the manner described under calico-printing. It is then dipped in an infusion of 8 oz. of myrobalan and dried. Next it is plunged in a solution of 2 oz. of ferrous sulphate and dried.

Myrobalan is again applied to the cloth in the same quantity and the piece dipped in a solution of sulphate of iron of the same strength as before and dried. The cloth is then boiled in water with 10 oz. of *majit* (Indian madder) or *al*, or two oz. of European alizarin, taken out, squeezed, dried and beaten smooth. Dyer's charge 12 annas.

**Section XI. Brown colours.**—*Agrai* or *sabri* (deep catechu brown) known in the Panjáb as *naswari* Piece one square yard.

*Processes.*—

Dipped in—

- (a) 4 drams of myrobalan infused in 40 oz. of water,
- (b) 3 oz. of a solution of ferrous sulphate (strength 1 dram to one ounce of water),
- (c) an infusion of 2 drams. of red ochre and dried.

Six drams of catechu is then dissolved in 4 oz. of water. Three drams of slaked lime is then added to the solution, and the mixture stirred with the hand for about two hours, when the froth on the surface will present a reddish brown colour. The cloth which has undergone the process (c) is soaked in the catechu-lime solution thus prepared, squeezed and dried in the sun. Dyer's charge 1 anna 6 pies.

A shade of *sabri* is obtained by dipping the material in alum solution, and when dried in a decoction of the pods of *babul* (*Acacia arabica*) (the *Namru-s-sabbaghin*).

*Katthai* (catechu brown)—Lucknow.—Piece 1 square yard.

*Processes of dyeing.*—

Dipped—

- (a) in an infusion of 4 drams of myrobalan,
- (b) in a solution of ferrous sulphate as in *agrai*,
- (c) in an infusion of 2 drams of red ochre.
- (d) in a solution of 4 drams of catechu to which 3 drams of lime are added.

The use of an acid infusion or of alum water should be scrupulously avoided.

Dyer's charge—1 anna 6 pies.

The *katthai* of Gonda and Azamgarh is dyed by dipping the material in a mixture of catechu and lime in equal quantities, thoroughly shaken for an hour.

In Jhānsi the shade is produced by dipping the material successively—

- (a) in myrobalan infusion,
- (b) in a solution of sulphate of iron,
- (c) in *naspal* decoction,
- (d) in alum solution,
- (e) in a decoction of leaves of *rusa* (*Adhotada vasica*),
- (f) in a mixture of catechu and lime dissolved in water. In the last mentioned bath the cloth is dipped twice.

*Shuttri* (light catechu brown).—Lucknow.—Piece 1 square yard.

Dipped—

- (a) in an infusion of 1 dram of myrobalan,
- (b) in a solution of  $\frac{1}{2}$  of a dram of sulphate of iron,
- (c) in a mixture of 2 drams of catechu and 1 dram of lime well stirred in water.

The method followed in Orai is reported to be as follows:—

Piece 1 square yard. The cloth is dipped—

- (a) in an infusion of one *majuphal* (*Quercus infectoria*),
- (b) in a solution of  $\frac{1}{4}$  dram of sulphate of iron,
- (c) in an infusion of 2 oz. of turmeric,
- (d) three times in a decoction of 8 oz. of pomegranate rind in  $\frac{1}{2}$  of a gallon of water,
- (e) in alum dissolved in the last bath,
- (f) in a mixture of 3 drams of catechu and  $1\frac{1}{2}$  drams of lime thoroughly stirred in water and kept in the sun for two or three hours,
- (g) in plain water and then in the bath used in process (f).
- (h) in the decoction of pomegranate rind already used in process (d).

*Sabz Kishmishi*—(nut brown).—Piece 3 yds.  $\times 1\frac{1}{2}$  yd.

Dipped.—

- (a) in an infusion of  $\frac{1}{2}$  oz. of myrobalan,
- (b) in 2 oz. of *kath* (iron liquor),
- (c) in an infusion of 4 oz. of turmeric,
- (d) in 60 oz. of yellow tincture of safflower (*pewar*).

Dyer's charge 2 annas.

*Surkh Kishmishi*—(snuff brown).—Piece of cloth 3 yds.  $\times 1\frac{1}{2}$  yd.

Dipped—

- (a) in an infusion of  $\frac{1}{2}$  oz. of myrobalan,
- (b) in 2 oz. of *kath* (iron liquor),
- (c) in an infusion of 1 oz. of red ochre,
- (d) in an infusion of 4 oz. of turmeric,
- (e) in 60 oz. of yellow tincture of safflower (*pewar*).

Dyer's charge 2 annas.

#### *Amaua.*

The name *amaua* is applied to a series of shades, representing the various colours assumed by the mango fruit during the various stages of its development, and the term therefore comprises a large number of shades, the more important of which are described below. They are chiefly dyed in the western part of Bundelkhand, but are not uncommon in other parts of the United Provinces.

*Sunahra Amaua*—(Jalaun).—Piece of cloth 3 yds.  $\times 1\frac{1}{2}$  yd.

- (1) Washed in water.
- (2) Steeped in a solution of 4 oz. of turmeric for two hours, washed and dried in the shade.
- (3) Plunged in a decoction of 26 oz. of pomegranate rind and dried in the shade. This is done three times over,

(4) Seven drams of alum added to the last mentioned bath and the cloth dipped in it.

(5) Dipped in a solution of  $\frac{1}{2}$  dram of red ochre or of 1 dram of safflower tincture in 8 oz. of water.

(6) Starched, dried and beaten smooth. Colour fast.

Dyer's charge  $2\frac{1}{2}$  annas.

*Anári Amaua*—(Jalaun).

(1) If the use of safflower or red ochre be dispensed with in the last mentioned case, the colour produced would be *Anári*, also fast.

*Shutri Amaua*—(Jalaun).—Cloth 1 square yard.

(1) Washed in plain water.

(2) Dipped in an infusion of one *majuphal* (*Quercus infectoria*).

(3) Plunged in a solution of sulphate of iron.

(4) Dried.

(5) Immersed in an infusion of 2 oz. of turmeric.

(6) Dipped in a decoction of pomegranate rind, wrung and dried. These processes repeated twice over.

(7)  $\frac{1}{2}$  dram of alum dissolved in the bath and the cloth dipped, squeezed and dried.

(8) Soaked in a bath prepared by dissolving 3 drams of catechu and  $1\frac{1}{2}$  drams of lime mixed together in 8 oz. of water, and stirred with the hands for three or four hours in the bath.

(9) Washed in plain water and dipped in catechu solution.

(10) Starched and dried.

*Zard Amaua*—(Lucknow).—Piece 3 yds.  $\times$   $1\frac{1}{2}$  yd.

(1) Washed in water.

(2) Dipped (a) in a solution of 2 oz. of red ochre and dried, (b) in a solution of 4 oz. of turmeric and washed in water, (c) in a decoction of 2 oz. of flowers of *tán* (*Cedrela toona*), (d) in 2 oz. of *shahab*, (e) in alum water.

Dyer's charge 2 annas.

*Kishmishi Amaua*—(Lucknow).—Piece 3 yds.  $\times$   $1\frac{1}{2}$  yd.

(1) Washed in water.

(2) Dipped (a) in an infusion of 6 drams of myrobalan, (b) in a solution of 2 oz. of red ochre, (c) in an infusion of 4 oz. of turmeric, (d) in a decoction of 2 oz. *tán* flowers or pomegranate rind.

Dyer's charge 2 annas.

The following method of dyeing *Kishmishi Amaua* is mentioned in the *Namas-sabbaghin*:—

*Kishmishi Amaua*.—Piece of cloth 2 square yards.

Dipped in—

(a) an infusion of 3 drams of *shingarf* (cinnabar) and dried,

(b) a decoction obtained by boiling 8 oz. of dry wood of jack tree (*Artocarpus integrifolia*), 6 drams of safflower, 6 drams of flowers of *harsinghar* (*Nyctanthus arborlristes*) and 6 drams of *tán* flowers.

*Sunchra Amaua*—(Lucknow).—Piece 3 yds.  $\times$   $1\frac{1}{2}$  yd.

(1) Washed with water.

## (2) Dipped—

- (a) in an infusion of 6 drams of myrobalan,
- (b) in a solution of  $1\frac{1}{2}$  drams of sulphate of iron,
- (c) in a solution of 2 oz. of turmeric,
- (d) in a decoction of 2 oz. of pomegranate rind,
- (e) in alum water.

Dyer's charge 2 annas.

Another method.—

## Dipped—

- (a) in alum solution,
- (b) in a decoction of equal quantities of *majit* (root of *Rubia cordifolia*) and pomegranate rind (the *Namu-us-sabbaghin*).

NOTE.—If the cloth dyed *Sunehra Amaua* be dipped in the indigo mât, the colour produced will be *Zamurrud*.

*Kopali Amaua*—(Azamgarh).—Piece  $2\frac{1}{2}$  yds.  $\times$   $1\frac{1}{2}$  yd.

## (1) Washed.

## (2) Dipped—

- (a) in a solution of 1 oz. of *majuphal* (*Quercus infectoria*).
- (b) in a decoction of 6 oz. of sappan wood, adding alum to it.

*Zard Amaua* (Azamgarh).

## (1) Washed.

## (2) Dipped five or six times—

- (a) in a decoction of *harsinghar* or marigold flowers,
- (b) in an alum bath.

*Amaua Gobrai* (Lucknow).—Piece 3 yds  $\times$   $1\frac{1}{2}$  yd.

## (1) Dipped—

- (a) in a decoction of 1 oz. of myrobalan,
- (b) in a solution of 2 drams of sulphate of iron,
- (c) in a solution of 2 oz. of turmeric.

## (2) Washed well.

## (3) Steeped in a decoction of pomegranate rind two days old.

## (4) Worked in a solution of 3 drams of alum.

Dyer's charge 2 annas.

*Kachrai Amaua* (Azamgarh).—Piece  $2\frac{1}{2}$  yds.  $\times$   $1\frac{1}{2}$  yd.

## Dipped—

- (a) in a solution of turmeric,
- (b) in a decoction of myrobalan,
- (c) in a solution of sulphate of iron,
- (d) in a decoction of *naspal* (pomegranate rind), to which alum is added.

There are three shades of brown, in the production of which scents play a more important part than dyes proper. Cloths dyed in these shades are admired greatly for their sweet smell and are used chiefly for lining night coverings known as *bihaf*, *razai*. They are :—

*Sandali* (light brown).—Piece  $2\frac{1}{2}$  yds.  $\times$   $1\frac{1}{2}$  yd.

## Method of dyeing.

A decoction is made by boiling together—

1	Balchhar (root of <i>Nordostachys jatamansi</i> )	...	...	...	1 oz.
2	Nagar Motha (root of <i>Cyperus pectenatus</i> )	...	...	...	1 oz.
3	Pauni	...	...	...	1 oz.
4	Sandal wood	...	...	...	1 oz.
5	Sugand Bala	...	...	...	1 oz.
6	Sugand Matri	...	...	...	1 oz.
7	Sugand Kokla	...	...	...	1 oz.
8	Safflower	...	...	...	1 oz.

One oz. of catechu mixed with a small quantity of lime is added to the decoction and the cloth dyed in it.

*Sufiyani* (light brown) Aligarh.—Piece  $2\frac{1}{2}$  yds.  $\times$   $1\frac{1}{2}$  yd.

Dipped—

(a) in an infusion of henna leaves,

(b) in an infusion of bark of babul (*Acacia arabica*),

(c) in a decoction of—

(1) *Chharilā* (*Parmelia chanchadahis*),

(2) *Balchhar* (root of *Nordostachys jatamansi*),

(3) *Nagar Motha* (root of *Cyperus pectenatus*),

(4) *Kapur Kachri* (root of *Hedythium spicatum*),

*Malageri* (a shade of catechu brown).

The following is the recipe for dyeing genuine *malageri*, a fancy colour, a favourite with the nawabs of former times:—

(1)	Chhail Chhabila	...	...	...	1 oz.
(2)	Nagar Motha (root of <i>Cyperus pectenatus</i> )	...	...	...	1 oz.
(3)	Kapur Kachri (root of <i>Hedythium spicatum</i> )	...	...	...	1 oz.
(4)	Nakh	...	...	...	1 oz.
(5)	Panjara	...	...	...	1 oz.
(6)	Birmi ( <i>Crotalaria Tapia</i> )	...	...	...	1 oz.
(7)	Sugandh Bala	...	...	...	1 oz.
(8)	Sugandh Kokla	...	...	...	1 oz.
(9)	Balchhar (root of <i>Nordostachys jatamansi</i> )	...	...	...	1 oz.
(10)	Jarantus	...	...	...	1 oz.
(11)	Burhna	...	...	...	1 oz.
(12)	Sugandh Matri	...	...	...	1 oz.
(13)	Laung (clove)	...	...	...	1 oz.
(14)	Ilaichi (cardamum)	...	...	...	1 oz.
(15)	Fresh leaves of henna	...	...	...	1 oz.
(16)	Sandal-wood powder	...	...	...	1 oz.
(17)	Zafran (saffron)	...	...	...	$1\frac{1}{2}$ oz.
(18)	Mishk (musk)	...	...	...	$\frac{1}{2}$ dram.
(19)	Oil of henna	...	...	...	1 dram.
(20)	Kattha (catechu)	...	...	...	3 drams.
(21)	Chuna (lime)	...	...	...	$\frac{1}{2}$ dram.

Substances Nos. 1, 2, 3, 4, 5, 7, 8, 9, 10, 11, 12 and 14 are all pounded together in a *harwan dasta*.

Nos. 17 and 18 are ground on a slab; Nos. 20 and 21 are dissolved in water, mixed together and thoroughly stirred for some time.

All these things together with Nos. 6, 13, 15 and 16 are mixed together in about 2 gallons of water.

The piece of cloth, which has previously been dipped, first in an infusion of  $1\frac{1}{2}$  drams of myrobalan and then in a solution of  $\frac{1}{2}$  dram of sulphate of iron, is put into the mixture, which is then placed on a fire and boiled for three hours.

After this the mixture is removed from the fire, but the cloth remains soaked in it till the following day when it is taken out and squeezed.



The decoction is then strained and otto of henna added to it, and the cloth is dipped in the decoction again.

Then it is taken out and squeezed. This completes the process of dyeing.

The piece so dyed is used as a *dupatta* by ladies in the highest spheres of native society and also for lining night coverings.

Now-a-days this elaborate and expensive process is rarely employed.

A very simple and cheap method of producing the colour, as commonly followed, is given below :—

Piece 3 yards  $\times$   $1\frac{1}{2}$  yards.

Dipped—

(a) in a well stirred solution of  $1\frac{1}{2}$  dram of catechu, and  $\frac{3}{4}$  dram of lime, in water.

Dipped again—

(b) in a solution of  $\frac{1}{4}$  dram of sulphate of iron,

(c) starched, squeezed and dried.

Then it is rubbed over with the otto of henna.

**Section XII. Miscellaneous composite colours.**—*Aqil Khani* (Drab)—*Aligarh*.—Piece  $2\frac{1}{2}$  yds  $\times$   $1\frac{1}{4}$  yd.

Dipped—

(a) in an infusion of 1 ounce of myrobalan,

(b) one dram of iron liquor freely diluted with water,

(c) a decoction of  $1\frac{1}{2}$  drams of sappan wood,

(d) solution of  $\frac{1}{2}$  dram of alum.

Another formula.—Piece 16 square yards.

Dipped—

(a) in a decoction of pomegranate rind (*naspal*) and dried in the sun,

(b) eight ounces of iron liquor added to the last bath,

(c) a solution of 6 drams of alum,

(d) a decoction of 3 oz. of sappan wood is then prepared by boiling the wood with salt water and stirred. The wood residue is boiled again to obtain a weaker decoction. The two decoctions are mixed together and divided into two equal parts poured into two separate baths. The cloth is dipped in one bath, dried, and then in the other, to which a little lime is added. (*The Namu-us-Sabbaghin.*)

*Aqil Khani* (Drab), Lucknow.—Piece of cloth 3 yds.  $\times$   $1\frac{1}{2}$  yd.

Dipped—

(a) in an infusion of 1 oz. of turmeric,

(b) in an infusion of 1 oz. of myrobalan,

(c) in 8 oz. of iron liquor diluted with water,

(d) in a solution of 3 drams of alum,

(e) in a decoction of 1 oz. of sappan wood thrown in water to make up a bath. The cloth is dipped in this bath 4 times, 1 oz. of the decoction being added to it each time.

Dyer's charge 2 annas.

*Unnābi* (bronze) of Lucknow.—Piece 3 yds.  $\times$   $1\frac{1}{2}$  yd.

Dipped—

- (a) in an infusion of 1 oz. of turmeric,
- (b) in an infusion of 1 oz. of myrobalan,
- (c) in a solution of 1 oz. of alum,
- (d) four times in an infusion of 4 oz. of sappan wood added to the bath in four instalments.

Dyer's charge 2 annas.

*Unnābi* (bronze) of Agra.—The cloth is first treated with castor oil, sheep or camel dung and water as for calico-printing, washed, dipped in alum solution, dried and washed again. It is then boiled with *āl* root until the desired shade is produced.

Colour fast. Dyer's charge 6 annas.

*Unnābi* (bronze) of Farukhabad.—

- (1) Cloth treated with castor oil, and sheep dung as for calico-printing, and washed.
- (2) Myrobalan applied.
- (3) Dipped in a solution of 2 oz. of alum.
- (4) Washed.
- (5) Boiled with—
  - (a) *majit*, 20 oz., or
  - (b) *āl* 20 oz. Colour fast.

*Kakrezi* (maroon) of Farukhabad.

If the cloth dyed *unnābi* by the last preceding method be dipped in a solution of 2 oz. of ferrous sulphate, or 4 oz. of iron liquor, the shade produced will be *kakrezi*. Colour fast.

*Kakrezi* (maroon) of Lucknow.—Piece 3 yds.  $\times$   $1\frac{1}{2}$  yd.

Dipped—

- (a) in an infusion of 1 oz. of turmeric,
- (b) in an infusion of 1 oz. of myrobalan,
- (c) in 16 oz. of *kath* (iron liquor),
- (d) in a solution of 3 drams of alum,
- (e) four times in an infusion of 4 oz. of sappan wood, divided into 4 equal parts, one being poured into the bath before each dip. Colour fast.

Dyer's charge 2 annas.

*Kakrezi* (brown) of Benares.—Piece  $2\frac{1}{2}$  yds.  $\times$   $1\frac{1}{2}$  yd.

Dipped—

- (a) in an infusion of 8 oz. of myrobalan,
- (b) in 4 oz. of pomegranate rind,
- (c) in an infusion of 4 oz. of sappan wood. (Buck).

*Telia Kakrezi* (dark maroon) of Lucknow.—Piece 3 yds.  $\times$   $1\frac{1}{2}$  yd.

Dipped—

- (a) in an infusion of 1 oz. of turmeric,
- (b) in an infusion of 1 oz. of myrobalan (*dal-harra*),
- (c) in 16 oz. of *kath*,
- (d) in a solution of  $\frac{1}{3}$  dram of alum,

(e) in an infusion of 4 oz. of sappan wood in the manner described under *kakrezi* of Lucknow.

Dyer's charge 2 annas.

*Ohunautia* (chocolate) of Lucknow.—Same processes as in the *Aqil khani* of Lucknow, only using 10 oz. of iron liquor instead of 8 oz.

*Kalejai* (chocolate).—Process same as in *Akil Khani*, except that the quantity of iron liquor used is raised to 12 oz.

*Kalejai* (chocolate) of Muzaffarnagar.—

Dipped—

(a) in an infusion of 1 oz. of myrobalan,

(b) in a solution of 1 oz. of green vitriol (*kasis*),

(c) in a solution of  $1\frac{1}{2}$  dram of magenta or of 4 oz. of sappan wood (*patang*).

*Makoiya* (dark plum) Lucknow.—

Dipped—

(a) in an infusion of 1 oz. of turmeric,

(b) in an infusion of 1 oz. of myrobalan,

(c) in 16 oz. of iron liquor diluted with water,

(d) in a solution of 3 drams of alum,

(e) four times in a decoction of 6 oz. of sappan wood divided into 4 parts, one part being added to the bath before each dip.

*Makoiya* (dark plum) of Aligarh.—Piece  $2\frac{1}{2}$  yds.  $\times$   $1\frac{1}{2}$  yd.

Dipped—

(a) in a decoction of 16 ounces of *naspal* (pomegranate rind),

(b) 32 oz. of iron liquor.

*Kochli* (coffee brown) of Lucknow.—

Dipped—

(a) in an infusion of 4 oz. of turmeric,

(b) 16 oz. of iron liquor diluted with water,

(c) in a solution of 3 drams of alum,

(d) in a decoction of 4 oz. of sappan wood in the manner indicated in the case of *makoiya*, Lucknow.

*Kochli* (coffee brown).—Piece  $2\frac{1}{2}$  yds.  $\times$   $1\frac{1}{2}$  yd.

Dipped—

(a) in an infusion of 1 oz. of myrobalan,

(b) in a solution of 8 oz. of sulphate of iron,

(c) in a solution of 3 drams of alum.

(d) in a solution of 4 oz. of sappan wood (Gonda, Azamgarh, Hardoi, Rae Bareli and Cawnpore).

Another method.—Piece  $2\frac{1}{2}$  yds.  $\times$   $1\frac{1}{2}$  yd.

Dipped—

(a) in a decoction of 2 oz. of myrobalan,

(b) in a solution of 1 oz. of alum,

(c) in a solution of 4 oz. of *majit* (root of *Rubia cordifolia*),

(d) in a weak solution of sulphate of iron.

Colour fast. Charge—3 to 4 annas. (Buck.)

The *Kochki* of Agra is dyed by dipping the cloth ( $2\frac{1}{2}$  yds.  $\times$   $1\frac{1}{2}$  yd.)—

(a) in an infusion of myrobalan and, when the cloth is dry,

(b) in alum solution (3 oz. to 32 oz. of water) and washed.

The cloth is then boiled with *al* root and flowers of *Grislia tomentosa* till it assumes a red colour. It is then washed and dipped in iron liquor. Colour fast.

Dyer's charge 6 annas.

*Arghawani* (a shade of maroon).—

Dipped—

(a) in a solution of 3 drams of alum and dried,

(b) in an infusion of 4 drams of myrobalan,

(c) in a decoction of 4 oz. of sappan wood. (The *Namu-us-sabbaghin*.)

*Lakhi* (brick red).—Piece 3 yds.  $\times$   $1\frac{1}{2}$  yd.

Dipped—

(a) in an infusion of  $\frac{1}{2}$  oz. of myrobalan,

(b) in a solution of  $1\frac{1}{2}$  dram of alum,

(c) four times in a decoction of 4 oz. of sappan wood, which is divided into 4 parts, one being added to the bath before each dip.

Dyer's charge 2 annas.

*Jamuni* (dark plum) of Aligarh.—Piece  $2\frac{1}{2}$  yds.  $\times$   $1\frac{1}{2}$  yd.

Dipped—

(a) in an infusion of 1 oz. of myrobalan,

(b) in 3 drams of iron liquor,

(c) in a solution of 3 drams of alum,

(d) in an infusion of 4 oz. of sappan wood.

*Uda* (a shade of purple).—Piece 12 square yards.

Two lb. of sappan wood is soaked in 4 gallons of water for a whole night, and then boiled till half the quantity of water has evaporated. The wood residue is boiled again in 4 gallons of water till it is reduced to two gallons.

The cloth is dipped—

(a) in a solution of  $2\frac{1}{2}$  oz. of alum,

(b) in an infusion of 2 oz. of myrobalan,

(c) in an infusion of  $2\frac{1}{2}$  oz. of sulphate of iron and dried,

(d) in the strong decoction of sappan wood and dried,

(e) in a solution prepared by dissolving  $2\frac{1}{2}$  oz. of alum in the weaker decoction of sappan wood and dried,

(f) in an infusion of 2 oz. of myrobalan which is usually added to the bath used in process (e),

(g) dried and beaten.

Colour fast. (The *Namu-us-sabbaghin*.)

*Surkh* (red).—Piece 12 square yards.

Dipped—

(a) in a decoction of 2 lbs. of sappan wood in 2 gallons of water, and steeped for a whole night, boiled till the water is reduced to one gallon and strained;

(b) in an infusion of 2 oz. of myrobalan and dried.

- (c) in a solution of  $2\frac{1}{2}$  ounces of alum and dried,
- (d) in a decoction prepared by boiling, in 2 gallons of water, the residue of wood left after straining the sappan wood decoction mentioned in process (a),
- (e) in the bath (a) in which  $2\frac{1}{2}$  oz. of alum is now dissolved,
- (f) in an infusion of 2 oz. of myrobalan. Colour fast.

(The *Namu-us-sabbaghin*.)

*Jilani* (a shade of red).—

Dipped—

- (a) in a decoction prepared by boiling in equal proportions by weight of the bark of *Acacia arabia* (*babul*),
- (b) the bark of *Zizyphus mammularia* (*Jharberi*),
- (c) *Majit* (roots of *Rubia cordifolia*),
- (d) Sappan wood,
- (e) *Mahawar*, the quantity of water used for boiling should be a gallon to every 40 oz. of the mixture of the above substances. (The *Namu-us-sabbaghin*.)

*Zamurradi* (a shade of green).—Piece 12 square yards.

The material is dipped—

- (a) in a decoction made by boiling 4 oz. of tender mango leaves in 16 oz. of water and dried,
- (b) twice in a fresh decoction of the same strength and dried,
- (c) in a solution of  $2\frac{1}{2}$  drams of alum and dried. (The *Namu-us-sabbaghin*.)

### Section XIII. Special colours and fabrics dyed by special methods.

#### A.—Special Colours.

In a few districts of these Provinces certain colours, which cannot be classified under any of the preceding heads, are produced by special methods comprising certain processes of a remarkably elaborate and arduous character. The following two colours are produced chiefly in Muzaffarnagar:—

(1) *Jastai* (English silver).—To begin with an alloy called "*rang*" is made by melting together tin and copper in the proportion of 80 to 1. This "*rang*" is then well hammered with a *kataura* (hammer) for hours continuously upon a stone imbedded in the mud floor of the dyer's house. As this is being done it is warmed and liquid glue (*saresh*) mixed with it and still hammered, oil and water in indefinite quantities being poured over the mass at intervals. This hammering process is extremely laborious and must be carried on for a very long time. It takes two men a whole day to thoroughly mix 1 lb. of "*rang*" and 4 oz. of glue, i. e., in the requisite proportions. The intimate mixture so prepared is called "*hil*."

The "*hil*" is then boiled in water and in this the cloth, having been previously washed, is dyed four times and then dried. When dry it is starched and rubbed with the "*ghonia*" (a smooth *sulaimani* stone set in a handle of wood). This polishing is continued the whole day long at the end of which the process is complete. The colour is fleeting and cannot be made fast. The actual cost for dyeing a piece  $2\frac{1}{2}$  yds. by  $1\frac{1}{2}$  yd. is Re. 0-7-6, and to this should be added Re. 0-6-0 on account of dyer's charge.

(2) "*Tambesri*."—The material is first washed, then steeped twice in a carefully made solution of "*har mizi*," a kind of red earth, 8 oz. to  $\frac{1}{4}$  gallon of water, and then dried. The red ground is thus obtained. It then undergoes the same process as

described under "*jastai*." The colour is also fleeting and cannot be made fast. The cost of dyeing a piece 2½ yds. × 1½ yd. is Re. 0-8-6 *plus* Re. 0-6-0 on account of dyer's charge.

(3) In Cawnpore a shade known as "*lajwardi*" (light blue), the chief characteristic of which is a sparkle given to the cloth with powdered mica, is dyed by the following process:—

A piece of cloth 2½ yds. × 1½ yd. is first dipped in indigo vat, dried and then soaked in an infusion of 4 oz. of flowers of *Butea frondosa* and 1 oz. of lime. It is then dipped in a solution of 1 oz. of alum and dried.

Thirty grains of powdered talc is then added with some starch paste to the bath containing the infusion of flowers of *Butea frondosa* already used, and the cloth is worked in this bath again till the particles of mica have completely adhered to its surface. It is then dried finally.

(4) *Dorukha*.—The peculiarity in dyeing this shade consists in producing one colour on one side and another on the other side of the cloth. The method is supposed to be a secret and is apparently known to a very limited number of dyers, who are exceedingly unwilling to reveal it. The author of the *Namu-us-sabbaghin* describes it as follows:—

A piece of muslin, 3 yd., × 1½ yds. is taken, and (1) dipped in an infusion of turmeric, (2) coated on one side with the white of an egg in order to render it stiff. When dry the same surface is coated with a thick mucilaginous infusion of the seed of *Plantago amplifolia* (*ispghol*) and the piece dried, (3) rubbed over on the other side with an infusion of indigo; when dry, the coating on the opposite side is removed by careful rubbing between the hands. The cloth will then present a yellow colour on one side and green on the other.

In Agra the process followed is reported to be briefly as follows:—

(1) The piece of cloth to be dyed is moistened with fresh juice of the leaves of *ghignar* (Indian aloe) and dried in order to impart a stiffness to the cloth. It is then spread out on a table. In the meantime two powders of the desired colours are separately rubbed in a mortar with the same juice into pastes of very thick consistency.

The pastes are carefully wrapped up in very fine pieces of muslin, and are then gently rubbed over the two surfaces of the cloth one after the other, the dye passing through the porous muslin on to the cloth.

The stiffness is afterwards removed by careful brushing. The colours are usually fleeting.

Arrowroot paste may be applied in place of aloe juice.

### B.—*Special fabrics.*

(1) *Kharua*.—This is a coarse fabric made by dyeing the native cloth commonly known as *gazi* with the *al* dye.

Its manufacture is however restricted to a few districts only,—Aligarh, Agra, Jhānsi and Jalaun. The cloth is dyed in the following manner:—

Piece 8 yd. × 1½ yd.—First of all it is thoroughly washed and soaked in water, with which some powdered sheep dung has been mixed. A mixture is then made of 4 lb. of castor oil, 5 lb. of the alkaline earth known as *rassi* and ½ lb. of sheep dung in about 30 gallons of water. The cloth is steeped in this mixture for 12 days and is then washed in clear water. Now it is ready for the application of the dye, and is first put in a decoction of 4 oz. myrobalan and then in a solution of 2 oz. of alum. Then it is dyed in *al*. For each piece of cloth measuring 8 yards by 1 yard, 30 lb. of powdered *al* is mixed with water and boiled.

Into this mixture, while boiling, the cloth is thrown and boiled with it till it has acquired a dull red colour. In some places only the dull red colour is considered to represent the standard shade, while in others, for instance in Aligarh, it is rendered brighter by dyeing the cloth again in a solution of the fast red European dye. After this the cloth is cleaned and washed and is then dipped in a solution of gum of *Anageissus latifolia* freely diluted with water, and when dry it is beaten smooth with wooden clubs.

In the Aligarh district the dyers follow a process of dyeing the *kharua* in *kachcha* or a fleeting colour. The chief point of difference between the dyeing of a *palka* and a *kachcha kharua* is, that whereas in the former method the cloth is boiled in a mixture of *āl* dye, in the latter method it is dipped 3 or 4 times in a decoction of sappan wood. The business of dyeing *kharua* is chiefly carried on by *chhipis*, who generally buy pieces of *gazi* cloth from native weavers, and after dyeing sell them either in retail or wholesale. A *chhipi* makes a profit of one anna per piece of 8 yards in dyeing. Sir E. C. Buck, in his "Dyes and Tans" gives the following table as showing the cost of dyeing a bale of 60 pieces of the cloth :—

					Rs. a. p.
20 lb. of sheep or goat's dung	...	...	...	...	0 0 3
4 gallons of castor oil	...	...	...	...	3 8 0
3 gallons of rassi	...	...	...	...	0 8 0
6 lb. of myrobalan	...	...	...	...	0 4 0
8 lb. of alum	...	...	...	...	0 7 0
6 lb. of <i>dha</i> flower	...	...	...	...	0 3 0
98 lb. of <i>āl</i> (best quality)	...	...	...	...	12 0 0
86 lb. of <i>āl</i> (inferior quality)	...	...	...	...	6 0 0
4 lb. of soap used in the intermediate process of washing	...	...	...	...	1 0 0
20 lb. of gum	...	...	...	...	1 0 0
Washing	...	...	...	...	1 0 0
Firewood	...	...	...	...	1 0 0
Pay of beaters ( <i>kundigars</i> )	...	...	...	...	1 0 0
Total	...	...	...	...	27 14 3

The *dha* flower mentioned above is the flower of *Grislea tomentosa*. It is occasionally used with the *āl* as a purifier.

The *kharua* is used in tents, book-binding, but chiefly for *bastas* and almost invariably by Muhammadan water-carriers (*bhishtis*) for the *lungi*.

(2) *Sālu* is another fabric of a red colour prepared by dyeing English cloth named *mārktin* in the *āl* dye, and was formerly extensively used for turbans, curtains, borders of female coats and female dress. Owing however to the introduction of cheap red cloth of English manufacture this fabric is now made so sparingly as to show that its manufacture will before long be almost given up. The following description of manufacture of *sālu* at the town of Orai in the Jalaun district has been borrowed from Sir E. C. Buck's book on "Dyes and Tans." Material—English cloth—20 pieces measuring 4 yards × 1 yard each taken at a time.

Processes—

(1) Washed.

(2) Bleached with castor oil 1 gallon, impure carbonate of soda 5 lb. and sheep's dung 1 lb., mixed in 20 gallons of water. For eight days the cloth is rubbed well in the mixture after which it is washed and returned to the dyer.

(3) *Terminelia chebula* (*Harrá*)—2½ lb. applied.

(4) Clubbed smooth.

(5) Fifty pieces of the cloth now taken, which is boiled with *Morinda citrifolia* (*āl*) 75 lb. and *Grislea tomentosa* flowers 4 lb.

(6) Washed.

(7) Starched with gum (*Acacia arabica*).

(8) Beaten smooth.

Cost of 20 pieces cloth Rs. 12-8-0, dyeing Rs. 3-12-0. Total Rs. 16-4-0. Charge Rs. 17 to 18.

(3) *Chunri* is a well known spotted cloth dyed generally in plain colours by dyers (*rangrez*) and is extensively produced in the month of Sâwan for the use of Hindu women. The following is the way in which the fabric is prepared :—The cloth to be dyed is washed and made into four folds. The places where it is intended to produce the spots are tied up with cotton threads in knots in the shape of screws a process requiring some ingenuity and practice. The cloth is then dipped in a tincture of *leusum* (safflower) or a solution of red European dye. After taking it out the piece is dried and the knots are undone, with the result that while the fabric is dyed red white spots appear in the places where the knots existed. In this way not only can white spots be produced on a red ground colour, but spots of one colour on a field of another. For example, in order to produce yellow spots on red ground, the cloth may be dyed yellow first, the knots may then be tied and the fabric dyed red. Sometimes transverse lines and stripes are produced in the above manner instead of spots, and the fabric is then called *laheria*. The borders are occasionally dyed in colours different to those of the spots in the field and very beautiful specimens of *chunri* are thus produced. The fabric is worn chiefly by women on the Nâgpanchami festival. Native red and yellow dyes were formerly used in colouring *chunri*, but, as in other branches of the dyeing industry, their place has now been taken by foreign dyes to a certain extent.

### CHAPTER III.

#### WOOL DYEING.

The dyeing of woollen cloth is not carried on to any great extent in these Provinces. It is confined to shawls, which are, as a rule, dyed by the people who deal in woollen goods and are called *doshala farosh*. There is a limited number of such men in every important city of these provinces, who originally came from the Panjâb or Kashmir. The ordinary *rangrez* can also be found here and there carrying on this business, but such instances are very few. The dyeing, however, of woollen yarn, as distinguished from woollen cloth, is done on a comparatively large scale. The yarn so dyed is chiefly used for carpets manufactured in most of the district jails and in the Mirzapur district, where the carpet industry is now fully established. In the Mirzapur town alone there are said to be over 100 establishments, large and small, where carpets are made. The method of dyeing woollen-yarn, as practised in Mirzapur, is, therefore, taken as a type for description.

The business is carried on by *Shaikhs* of the Kâlinbâf class, and to a much smaller extent by other castes, such as Julahas, Baniahs and Tambolis.

#### *Preliminary treatment of the material to be dyed.*

In India the fleece of commerce is usually a mixture of wool of three different colours, namely, white, black and brown. The proportion of the white wool in the fleece is generally very large, of black comparatively small, and of brown smaller still. The first process which the fleece has to undergo on being brought into the factory is *chhatai*, or the sorting of the wool of each kind. The cost of sorting amounts to one anna per *panseri* (2 seers *lambari*).

The wool is then carded like ordinary cotton by the common carder (*dhunia*), who is paid either at one anna per *panseri* of wool carded or as a labourer at Re. 0-2-6 per diem.

The carders of wool are generally dependents of the factory, and receive advances from the proprietors under written agreements binding them to work for the factory only.



After carding the wool is spun into thread in the *charakha*, as a rule by women. A woman spins from 2 to 3 pounds of wool in a day.

The wool is wound in *kukris* or cops (balls of a more or less conical shape) varying in weight from 2 to 4 oz. The wages for spinning amount to half an anna per pound.

The wool spun into *kukris* is then subjected to the process of *kholai*, which is done in the following manner:—Two *kukris* are taken at a time. The ends of the thread in each are held together between two fingers and the two threads pulled on. The double thread obtained thus is left in small heaps on the ground. This work is generally done by females of the owner's family. The double thread is then made into *lachchas* or *latias* (hanks), and the process is called "*latia karna*" or "*Lachcha banana*." The form of a *lachcha* or *latia* closely resembles that of the English figure of 8 and its weight varies from  $\frac{1}{2}$  to  $1\frac{1}{2}$  lb. Special labourers are employed for the work. They are paid at the rate of Rs. 4 per mensem each, and they are seldom put to other work. A labourer can make from 15 to 20 "*lachchas*" in a day.

The wool made into "*lachchas*" is then cleaned in the manner described below, the process being known as "*dhulai*":—

About 8 gallons of water is filled in a copper vessel called "*kunra*" which is placed on a fire. When the water has reached the boiling point, *reh* 8 lb. and *sajji* (crude carbonate of soda) 8 oz. are thrown into it and boiling continued for a few minutes. Five *lachchas* of wool are thrown in and constantly turned round in the vessel by means of a stick. It takes the "*Lachchas*" about an hour to be scoured or cleaned to the required degree, to determine which demands a certain amount of practical experience.

The boiling of 5 "*lachchas*" in this way requires the consumption of about 50 lb. of fuel. This process of boiling is called "*kharna*." The *chulha* or furnace for this purpose is so constructed as to allow two "*kunras*" (copper vessels) to be placed on it at a time. Each "*kunra*" has five "*lachchas*," and the 10 "*lachchas*" that are thus boiled at a time go to form what is technically called a "*pur*." When boiled the "*lachchas*" are taken out of the vessel and while yet hot they are wrung out by means of wooden bars and left on the ground to dry. When dry they are taken to the river for washing off, which is done by the workmen of the factory. Two men generally wash one "*pur*" in half an hour. The "*lachchas*" may, if required, be washed in the wet state in which they are taken out from the vessel, and this would probably be the better plan.

The object of "*dhulai*" is not only to free the "*lachchas*" of dirt and grease, but also to make them soft and ready to receive the colour in which they are to be dyed. If a "*lachcha*" is allowed to remain in the boiling vessel longer than is necessary, or if it is not washed for a sufficiently long time, which varies from 2 to 3 hours, it cannot be dyed properly. After washing the wool is ready to be dyed. The following is a description of the most important colours in which it is dyed:—

#### I.—BLACK.

1. *Kala* or *Siyah* (black).—Three gallons of water is heated in a "*kunra*" (copper vessel) to the boiling point. *Babul* pods, 3 lb., *kasis* (ferrous sulphate) 1 lb. and *\*jharwan* 4 lb. are then thrown into the water, having been reduced to powder previously. The boiling is continued for about one hour and the "*lachcha*" is then thrown into the decoction. It is allowed to remain on a slow fire for some hours. It is then taken out, wrung and washed in the river and finally dried in the sun. This colour is, as a rule, applied to the wool of black colour only.

\* NOTE.—*Jharwan* is burnt clay mould used for casting brass articles. A well-burnt mould is selected for the purpose of dyeing, but doubtless well-burnt clay in any form would suit equally well. The alumina of the clay, of course, acts as mordant in fixing the dye.

In the Lucknow Jail "*kala*" (blue black) is dyed in the following manner :—

Eighty pounds of iron, 40 lb. of treacle and 40 lb. of dried raw mangoes are steeped in 40 to 45 gallons of water for a week. The iron solution thus prepared is called *kath*; 1½ lb. of myrobalans are added to 3 lb. of the solution and 2 lb. of wool thrown into the mixture, which is then boiled till the wool has acquired the required colour. The wool is then taken out, wrung and dried.

Sir Edward Buck in his "Dyes and Tans of the N.-W. P." mentions the following process for dyeing black :—

"The wool is soaked in an infusion of myrobalans obtained by crushing them and slowly filtering water through them. An ounce of myrobalan is sufficient for 1 lb. of wool. The wool is next plunged into another vessel containing a very strong solution of sulphate of iron."

## II.—BLUE.

2. *Nila*, dark blue (Lucknow Jail).—Two pounds of wool are boiled for an hour with half a gallon of water into which 4 oz. of sulphate of indigo has been dissolved. The wool is then washed in cold water and dried.

3. *Āsmāni* (pale blue).—The wool to be dyed in this colour is first washed in the following manner :—

Eight ounces of *ritha* (*Acacia concinna*) is crushed and boiled in a gallon of water. The wool is then dipped in this decoction and allowed to remain there for about 12 hours. It is then taken out and washed in the river. Then it is dipped in a weak solution of sulphate of indigo (1½ drams to a gallon of water). The washing is done at the factory and the dyeing by the professional *rangrez* (dyer), the latter's charge being 8 annas per "*lachcha*."

4. *Surmai* or *naifarmani gahra* (dark blue).—The hank of wool is first steeped in a weak solution of lime and allowed to remain in it for six days.

It is however taken out daily, beaten on slabs of stones and again put into the lime water. On the sixth day it is finally taken out and washed in the river. Then it is made over to the *rangrez*, who dyes it in the indigo vat.

In Lucknow Jail the shade is produced by boiling the wool in a solution of sulphate of indigo and then dipping it in a solution of the European magenta dye.

5. *Ilalka surmai* or *naifarmani* (deep blue) of Lucknow Jail is dyed as above. The wool is, however, boiled in the solution of sulphate of indigo for a shorter time, and the dips into magenta are of a shorter duration.

## III.—COMPOUNDS OF RED AND BLUE.

6. *Sausani* (purple).—One and half drams of lac is boiled with a gallon of water; 6 drams of muriatic acid is then added, and a hank of wool put into the liquid and boiled for some time. It is then taken out and dipped in a solution of sulphate of indigo (as prepared for the *āsmāni* colour) to which a little alum is added.

7. *Kokai* (lavender).—In Lucknow Jail the wool is first dyed pale blue or *āsmāni*, and then dipped in a solution of magenta.

8. *Falsai* (lilac) of Lucknow Jail is dyed in the same way as *kokai*, but in this case a weaker solution of indigo sulphate is used.

## IV.—COMPOUNDS OF RED AND YELLOW.

9. *Badāmi* (orange).—As in case of *agrai*, No. 26, the wool is first washed in the river and dried in the sun. It is then put in a decoction of *lodh*, *Symplocos racemosa* (8 oz. to 20 lb. of water) and allowed to boil for about an hour, when it is taken out and put in a warm alkaline solution known as *khar*. After boiling the wool in this solution for 10 minutes the hank is washed in the river and dried in the sun.

*Preparation of khar.*—Khar is made by mixing 8 oz. of lime or 2 lb. of *reh* with 20 lb. of water in a stone vessel and stirring the mixture thoroughly. This quantity usually suffices for one hank of wool.

#### V.—GREEN.

10. *Kahi* (sap green).—The wool is dyed three times in a decoction of *tesu* (flowers of *Butea frondosa*) and then boiled with a mixture of *lodh* (*Symplocos racemosa*) and *sajji* (crude carbonate of soda) in water. It is then steeped in a weak solution of *sajji* and dried. In Lucknow Jail, however, *kahi* is dyed in a different manner as follows:—

First of all a strong solution of turmeric (*haldi*) is made and the wool is steeped in it for a few hours. It is then boiled in a solution of sulphate of indigo and then dipped in a solution of European green aniline dye to which alum is added. The wool is kept in this solution for a few minutes, then taken out and washed with clean water.

11.—*Dhani* (light green).—The hank of wool is kept in a strong solution of turmeric (*haldi*) for a whole night. In the morning it is taken out and boiled in a solution of the European green dye to which a little alum is added. It is then washed in clean water and dried.

12. *Pistai* (yellow green).—The hank of wool is first dyed in indigo and then boiled with turmeric (*haldi*) and muriatic acid. It is then dried in the shade.

13. *Anguri* (grape green).—The hank of wool is first dyed in a weak solution of turmeric and then in the European green dye to which alum is added.

14. *Mor ka rang* (peacock green).—In order to dye wool in this colour a "*lachcha*" or hank of  $1\frac{1}{2}$  lb. (which is not however submitted to the previous treatment of "*dhulai*" or "*kharna*") is first steeped in a weak solution of lime, in which it remains for six days continuously, except that it is only taken out once a day in order to be beaten on a stone slab, and put into the water again. It is finally taken out on the sixth day and washed in the river. It is then dyed in a strong solution of indigo and washed. After this the "*lachcha*" while yet wet is plunged into a liquid prepared by mixing together a decoction of myrobalan and an infusion of *tesu* (flowers of *Butea frondosa*). The decoction of myrobalan is prepared by boiling 2 lbs of *harra* (*Terminalia chebula*) in about 2 gallons of water till half the quantity of water has evaporated. The infusion of *tesu* is obtained by steeping 4 lb. of the flowers in 2 gallons of water for six hours.

15. *Sabz* (green).—To produce this colour a "*lachcha*" previously submitted to the treatment called "*kharna*" is first dyed in a weak solution of indigo and then washed in the river. It is then plunged in a gallon of *pewar* (the yellow dye obtained by exhausting flowers of *Carthamus tinctorius* in cold water), to which half a pound of ground turmeric is added. The wool remains in this solution for the whole night. It is wrung out in the morning and left to dry in the shade.

16. *Sabzi pakki* (olive green).—One pound of *harsinghar* flowers are put in 4 lb. of boiling water and steeped for the whole night. In the morning the flowers are squeezed and the refuse thrown away. More water is then added to the infusion thus obtained and the wool (one hank) is then steeped in the solution for 24 hours. The hank is taken out in the following morning and dried in the sun. In the meantime an infusion is prepared by steeping 1 lb. of pounded *babul* pods, and  $\frac{1}{2}$  lb. of pounded myrobalan in fresh water and putting the mixture in the sunshine. When after an hour or so the mixture begins to ferment, 2 oz. of sulphate of iron is added to it. The whole mixture is then poured into the *harsinghar* infusion already prepared, to which however more water is now added. The dry hank is then dipped in the bath thus prepared. It is taken out, wrung and left in the sun to dry. This colour can be dyed in all seasons, but it is essential that the weather be fine.

## VI.—REDS.

17. *Surkh* (red).—Three pounds of lac are boiled in 12 gallons of water and 1½ lb. of muriatic acid are added to it. Then the hank of wool is put into the liquid and boiled for three hours. It is then taken out and washed with clean water. It is then dipped in water acidified with muriatic acid and warmed for a short time. After this the water is wrung out and the wool left to dry.

18. *Gahra gulnar*—(Bronze red).—

- (1) \**Batti* lac 4 oz. is pounded and boiled with 2 oz. of sulphuric acid in 20 lb. of water.
- (2) When the water begins to boil a hank of wool previously washed is thrown in and boiling kept on for an hour.
- (3) Washed.
- (4) Twenty pounds of clear water are put to boil. Red European dye 6 drams, sulphuric acid 20 oz. and pounded turmeric 3 drams are thrown in it and stirred. The wool is now plunged in the liquid and kept boiling for an hour.
- (5) Washed.

The crude lac separated from twigs is thrown into a stone vessel called *nānd* and water poured in. The contents are trampled down with feet and more water added. The mixture is then thoroughly shaken and transferred to a cloth strainer. The strained liquid is allowed to run through drains into a tank, and the residue returned to the stone vessel to be treated again in a similar manner. This process is repeated several times. The liquor in the tank is allowed to stand until all particles of lac held in suspension are deposited at the bottom. The clear water is then separated and thrown away. The sediment is transferred to a piece of coarse cloth, which is then folded and squeezed in a press to get rid of moisture. When completely dry the substance is called *batti lac* and is cut into bits, or slices with a knife which are dried in the sun.

Another method which is often adopted is to allow the water to be evaporated by the heat of the sun; then when the lac dye is partly dried it is cut into squares and thoroughly dried.

19. *Halka gulnar* (scarlet).—One ounce of red European dye dissolved in 4 oz. of sulphuric acid; is mixed with 2 gallons of warm water in a copper vessel coated with tin. The vessel is placed on a fire. When the water begins to boil the hank, which has already undergone the process of "*dhulai*," is put in and boiled for an hour. When fully dyed the hank is taken out, washed in the river and dried in the sun.

*N.B.*—Care should be taken before the hank is taken out to see whether it has acquired the required shade. If not, more red European dye mixed with sulphuric acid in the same proportion as above should be added.

20. *Malla gahra* (strawberry).—Eight ounces of *batti lac*, mixed with 8 oz. of sulphuric acid, is added to 2 gallons of warm water in a tinned copper vessel, and the hank, which has already undergone the process of "*dhulai*," is put in to boil for an hour, when it is taken out and washed in the river. The hank is then boiled for an hour in a mixture of 20 lb. of pure water, 8 oz. of *lodh* (*Symplocos racemosa*) and 8 oz. of mango rind in a tinned copper vessel. It is then taken out, wrung and dried in the sun.

21. *Malla halka* (crushed strawberry).—The process of dyeing is the same as that of *malla gahra*, but with only half the weight of the several ingredients.

22. *Gulabi* (claret).—The process of dyeing *gulabi* is identical with the one followed in the case of *malla*, only the proportion of ingredients used is as follows:—

<i>Batti lac</i>	...	...	...	...	1 lb.
Sulphuric acid	...	...	...	...	1 lb.
<i>Lodh</i> ( <i>Symplocos racemosa</i> )	...	...	...	...	1 lb.
Mango acid	...	...	...	...	1 lb.

\*Manufacture of *batti lac*.

## VII.—BROWN.

23. *Khatmali* (dark brown).—Lac 12 oz. is crushed and steeped in 1 lb. of fresh water for the whole night. In the morning it is taken out and pounded. The pounded lac is stirred up in 10 lb. of water and 2 oz. of sulphuric acid is poured into it. The wool is plunged into the mixture and boiled for about an hour and a half, after which it is taken out and washed in the river. It is then again boiled for one hour in a solution of 2 oz. of pounded *lodh* (*Symplocos racemosa*), 10 lb. of water and 2 oz. of dry mango rind. After this the hank is taken out and placed in a blanket till it is cool. After about half an hour it is taken out and left in the sun to dry.

24. *Shuttri* (nut brown).—Two infusions are prepared by steeping 8 oz. of myrobalan and 8 oz. of flowers of *Butea frondosa*, each in 15 lbs. of water separately. In the morning they are mixed up and 3 oz. of catechu is then added to the compound, with which the hank of wool is then boiled on a slow fire for one hour. It is then taken out, squeezed and dried.

25. *Halka Agrai* (light brown).—

<i>Butea frondosa</i>	...	...	...	...	4 lb.
<i>Symplocos racemosa</i>	...	...	...	...	6 oz.
Catechu	...	...	...	...	4 oz.
Lime	...	...	...	...	8 oz.

All the processes of dyeing are the same as in the case of *gahra agrai* (No. 26).

26. *Gahra agrai* (brown).—

- (1) A hank of wool is thoroughly washed with plain water.
- (2) Steeped in an infusion of flowers of *Butea frondosa* (*tesu*) for 18 hours. The infusion is obtained by soaking 8 lb. of the flowers in 8 gallons of water for 12 hours and rubbing them in before the liquid is strained.
- (3) Taken out and put on a frame to allow the water to trickle down.
- (4) Dried in the sun.
- (5) Process Nos. 2, 3 and 4 repeated.
- (6) Boiled with 12 oz. of *lodh* (*Symplocos racemosa*) and 8 oz. of catechu for about an hour.
- (7) Eight ounces of lime is thrown in 10 lb. of water in an earthen jar, and the wool, together with the dye liquid used in process No. 6, is put into the lime water.
- (8) Taken out after half an hour and put in a closed copper vessel for the night.
- (9) Dried in the sun.

N.B.—Wool dyed in an infusion of *tesu* flowers is technically called *kalawa*.

27. *Sona halka* (old gold).—The process of dyeing this colour is the same as that of *sona gahra* (No. 28), only the proportion of ingredients used is as follows:—

<i>Tesu</i> flowers	...	...	...	...	8 lb.
<i>Lodh</i>	...	...	...	...	8 oz.
Catechu	...	...	...	...	4 oz.
Water	...	...	...	...	2 gallons.

28. *Sona gahra* (catechu brown).—The wool is first dyed to make *kalawa* as in case of *agrai*. It is then washed and put in a boiling mixture of 8 oz. of catechu, 2 gallons of water, 1 lb. of *lodh* (*Symplocos racemosa*), and allowed to boil for an hour, when it is wrung and dried in the sun.

## VIII.—YELLOW.

29. *Pistai* (lemon yellow).—Two pounds of flowers of *Butea frondosa* (*tesu*) are soaked in water for six hours and rubbed in the water till the dye is thoroughly extracted.

The refuse is then taken out and placed aside. The hank is steeped in the infusion and the refuse spread over it and allowed to stand for 12 hours, when the hank is removed and dried in the sun. *Babul* pods 2 oz. are previously steeped with a small quantity of *kasis* (sulphate of iron) in some water. Two gallons of water is now added to the mixture, which is then strained and used for dyeing the hank.

30. *Malai* (cream).—Wool which has already undergone the process of "*dhulai*" is rubbed in a solution of 4 oz. of *pewri* with 2 gallons of cold water, taken out and beaten on a stone. If the shade produced is light the wool is again dipped, beaten and dried. It is then washed in the river.

31. *Gandhaki* (sulphur yellow).—The wool is washed in clear water from the river and dried in the sun. An infusion of 4 lb. of flowers of *Butea frondosa* with 10 lbs. of water is prepared and the hank steeped therein for 24 hours.

It is taken out, squeezed and dried, and again dipped for 24 hours in a fresh infusion of the same strength of *Butea frondosa* flowers. The hank is then taken out and dried in the sun.

32. *Pamba* (yellow).—Eight ounces of powdered turmeric is dissolved in 3 oz. of sulphuric acid. The solution is then poured in 2 gallons of boiling water. Wool previously subjected to "*dhulai*" is then put in and boiling kept on for an hour, when it is taken out and dried in the shade (colour fleeting).

N.B.—If *Akabbir* be used in place of turmeric the colour produced will be fast.

#### IX.—DRAB.

33. *Khaki* (stone drab).—Eight ounces of *babul* pods are crushed and put in water, which is exposed to the sun. After two or three hours the liquid becomes frothy. More water is then poured in and the pods stirred up. The liquid is then strained off and two drams of *kasis* (sulphate of iron) is dissolved in it. The hank is then dipped, wrung and taken out to dry in the sun. The colour is dyed generally in the summer and winter, the rainy season being considered unfavourable for it. The dye is prepared either in an earthen pot or a copper vessel coated with tin. Iron pans should not be used.

34. "*Terra cotta*"\* (flesh-coloured drab).—One and a half drams of *batti* lac dissolved in 10 drams of sulphuric acid is mixed with 2 gallons of boiling water, in which the hank previously subjected to the process of "*dhulai*" is plunged. If the shade acquired by the wool in quarter of an hour be lighter than required, a little more of the solution of lac and sulphuric acid should be added in the course of boiling. The addition of lac solution is thus continued at certain intervals until the required shade has been obtained, a fact which can be ascertained by the experienced eye. The wool is then washed and dried in the sun.

### CHAPTER IV.

#### SILK DYEING.

Silk dyeing on a large scale is carried on chiefly in the city of Benares, noted for its silken fabrics known as *mashru*, *gulbadan*, *kamkhab*, *sari* and *khes*. It is also practised to a smaller extent in the district of Azamgarh, so famous for its satins, and on a still smaller scale in the cities of Agra and Lucknow.

The best methods of dyeing are those followed in Benares which are imitated with unimportant modifications in other centres of minor importance. Formerly silk was dyed entirely with native dye substances, but now the native silk dyeing industry

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\* This name has been recently added to the native vocabulary by the dyers of Mirzapur, but is not used in the right sense.

is decaying fast even in Benares on account of a remarkably extensive use of the aniline dyes in this branch of dyeing.

The following different varieties of silk are imported to Benares, where they are used after dyeing for the manufacture of different fabrics.

#### A.—Bengal varieties.

(1) *Kirchi*.—Imported from Calcutta, where it is manufactured at the silk factories. This variety is of a pale yellow colour and is the most costly of all, owing to its extreme fineness and softness. Price Rs. 8-2-0 per lb.

(2) *Tanduri*.—Imported from Máláda. This is of a yellow colour, sufficiently fine and soft, and stands next to *kirchi* with regard to quality. Price Rs. 6 per lb.

(3) *Bának* or *Phalla*.—Brought from Rampur Hant (Bengal); has a yellow or white colour, but is somewhat inferior to the last. Price Rs. 5-2-0 per lb.

(4) *Suta*.—This is imported from Máláda and is of a grey colour. It is the coarsest of all. Price Rs. 3 to 3-8-0 per lb.

#### B.—Samarkand and Bokhara varieties of silk.

*Sangal*.—Consisting of two varieties, *wardwani* and *bashiri*, imported from Amritsar. They are of two different colours, namely white and yellow. The thread is usually very fine and particularly strong, hence they are greatly used for making *gota* and *kanari*. The hanks of silk as sold in the market contain threads of varying thickness, and the manufacturers of silk fabrics have therefore first to separate the thick from the thin threads, the process being called *ukelna* (sorting).

The import of the *sangal* into Benares has opened a regular business for Panjáb experts in the city of Benares, as the local workmen are not sufficiently skilful to do the sorting work with this variety of silk.

The *sangal* silk is however not imported in such large quantities now as it used to be before.

#### C.—China silk.

*Sultani*.—This is imported from Bombay and is of a fine quality. Colour yellow. Price Rs. 6 to 6-4-0 per lb.

### Dyeing.

The silk dyeing process is as a rule preceded by a cleaning process of some kind or other. The process most commonly followed is described below :—

Two pounds of soap are boiled with a gallon of water. While boiling the silk is plunged into the liquid and boiling continued for nearly half an hour. The vessel is then removed from the fire, and when cold the silk is washed in fresh water and immediately thrown into the dye solution and turned round in the bath until it is dyed to the shade required. It is then wrung out and dried in the shade.

The dye solution is usually prepared by simply dissolving the European dye powder in water which is warmed if necessary. By far the largest number of shades are dyed in this manner by the Julahas (weavers) themselves, but they are all of a more or less fleeting nature. To obtain permanent colours they have, however, to resort to the old native methods, which are described below in full detail :—

(1) *Dyeing red with lac*.—Crude lac is usually purchased from Ahraura (Mirzapur) at 1½ to 3 annas per lb. In this state it contains a large quantity of wood,

dirt and other impurities. The raw material is therefore first pounded and cleaned of its wood, dirt, &c., as far as possible. It is then ground in a handmill and passed through a sieve. Ten lb. of the fine powder is put into an iron pan containing 3 gallons of water, with which are mixed 1 oz. of powdered *sajji* and  $\frac{1}{2}$  oz. of *reh*, the latter being dissolved previously in a couple of ounces of water. The mixture is thoroughly stirred with a piece of wood and filtered through a cloth strainer. The filtrate is poured into a pan and put over a mild fire, the residue being taken away and used for making *chapra* (shell lac). After two hours warming the liquid is removed from the fire, kept in open air for 12 hours and then poured into jars. The silk to be dyed is first bleached in the following manner:—About 6 lb. of *reh*, worth about  $1\frac{1}{2}$  annas, are mixed with a gallon of water. The mixture is allowed to stand for two or three hours and then put on a fire. While boiling 2 lb. of raw silk are thrown in and the boiling continued for nearly an hour. The pan is then removed from the fire and the silk taken out to be washed in the river.

The solution of lac dye kept in the jars is then put into a vessel and the washed silk while still wet is plunged into it. It is slowly turned round in the vessel, wrung out and dipped again. These processes are repeated for half an hour, and the silk is then allowed to steep in the liquid for 24 hours, when it is taken out and squeezed.

The liquid left in the dyeing tub is rejected, and the silk is again subjected to similar process of dyeing in a fresh quantity of dye taken out of the jars. On the first day the silk acquires a light colour which becomes deeper and deeper with each subsequent dipping, until after dyeing the silk daily for three or four days in this manner, the permanent colour known as *lakhi* is obtained. The solution rejected by the dyers after each day's dyeing is sold at  $\frac{1}{2}$  anna per jar (*ghara*) to shoemakers, who use it for dyeing the leather known as *nari*. Should the quantity of alkali used in the process of bleaching or of preparing the lac solution be excessive, the silk assumes a woolly appearance like that of ginned cotton and becomes unfit for weaving purposes.

The *patwas* then buy it from the weavers and twist it again to bind jewellery with. The charge for dyeing a seer (2 lb.) of silk is only one rupee, while before the introduction of European dyes it used to vary from  $2\frac{1}{2}$  to 3 rupees a seer.

The dyers engaged in the dyeing of silk with lac belong to a low caste of Hindus known as Lahera. The Laheras also occasionally make shell-lac, but only when they have no dyeing to occupy their time. The introduction of European dyes appears to have interfered very considerably with their trade. Formerly the business was carried on by hundreds of people in Benares. Now it is confined to not more than a dozen men. The rest have been under the necessity of resorting to other trades, chiefly manufacture of *kalabatun*, which consists in twisting silver and cotton or silk threads together.

(2) *Dyeing orange with kamila*—(Fruit powder of *Mollatus philippinensis*).—An alkaline mixture is first prepared by mixing 10 lb. of *reh* with 5 lb. of lime. The mixture is put in a tub having at the bottom a hole about  $\frac{1}{4}$  of an inch in diameter, into which some twisted straw is inserted loosely to let the water, which is subsequently added, drop down. Three gallons of water is the quantity poured and allowed to filter through. The filtrate is collected in a pot placed down below. A mud stand known as *kharbujhna* is usually to be seen in each dyer's house over which the filter is placed. To dye one seer (2 lb.) of silk 3 gallons of water is boiled in an iron pan, one seer of *kamila* is then dissolved in 3 pints of the alkaline solution and the solution poured into the pan. The mixture is kept boiling for a few minutes and then removed to the dyeing tub. One seer of silk is then plunged into it and gently turned. The silk when dyed is taken out and washed with cold water. The solution left after dyeing, known as *ugar*, is thrown away. *Kamila* is obtained from the bazar at Rs. 30 to 40 per maund (82 lb.) and is used for dyeing a permanent orange colour. *Kamila* is more commonly used for dyeing twisted (*asarha*) than for



untwisted silk. The cost of dyeing amounts to 13 or 14 annas per seer and the dyers charge to one rupee per seer. Formerly there were three families of *kamila* dyers in Benares and now there are two, which have to content themselves with a slow business, as *kamila*, like other native dyes, is being gradually replaced by foreign dyes. Dyeing with *kamila* is also carried on by Laheras.

(3) *Dyeing yellow*.—A permanent yellow colour is obtained by dyeing silk in a decoction of *asbarg* (*Delphinium ajacis*), prepared by boiling 4 lb. of *asbarg* in 7 gallons of water; 6 oz of alum are then dissolved in the decoction and the silk dyed in the usual manner.

(4) *Dyeing with indigo*.—The silk after being washed is simply dipped in the indigo vat to dye blue and its shades.

(5) Green is obtained by dyeing the material first with *asbrag* and then with indigo.

Some years ago silk was largely dyed with cochineal, but owing to free introduction of foreign dyes that dye substance is not used now except under special circumstances, e.g., when a manufacturer of *kamkhab* receives a special order to make that fabric with silk dyed with cochineal. The following method of dyeing with cochineal is quoted from Sir E. Buck's "Dyes and Tans of North-Western Provinces and Oudh":—

"Half a pound of cochineal is steeped in a quart of water in which half a pound of *baznak* (pistachio flower) has been mixed. The cochineal is well rubbed with the hand and the water strained off. This is done four times, the same quantity of cochineal and *baznak* being rubbed in four separate quantities of water, giving four infusions of different strength. These are mixed together and boiled; one-fourth of the decoction is kept separate, and the silk to be dyed is boiled in the remaining three-fourths. When the red colour is attached to the silk the other fourth is added and the silk allowed to steep in the mixture for 48 hours. It is then dried in the shade, washed and again dried, when the process is complete."

Dyeing with cochineal is also occasionally done in Agra.

## CHAPTER V.

### CALICO-PRINTING.

The industry is generally known by the name of *kapre ki chhapai* and appears to have been in existence in these Provinces for a very considerable period. Its history is obscure, but in all probability the art originated in the ancient city of *Kanauj*, where, in a backward condition, the industry is carried on up to this day. Calico-printing is most flourishing now in Lucknow, Farrukhabad and Jahangirabad (Bulandshahr), but is carried on more or less in most of the towns of the North Western Provinces and Oudh.

It appears that a large number of *Kanauj* artisans shifted to Farrukhabad during the reign of Muhammadan Nawábs, and made considerable improvements in the industry under their patronage.

From Farrukhabad the art was imported to and gradually established in Lucknow under encouragement from the Nawábs of Oudh, and there it acquired the perfection for which Lucknow enjoys the present reputation. Jeypore seems to have contributed the art to Jahangirabad, where *chhipis* originally came from Rájputána under the auspices of Rája Anup Rai in the reign of Jahangir. The importance now attached to Jahangirabad appears however to be solely due to the efforts of Mr. Growse, once Collector of Bulandshahr, who introduced new designs and fabrics suitable to the European taste about 15 years ago, and worked most zealously in the direction of general advancement of the local industry. The beautiful curtains and table cloths now turned out by the Jahangirabad *chhipis* are really the outcome of his labour. The manufacture of these special fabrics has been hitherto confined to Jahangirabad.

They have met with public appreciation, not only in India, but in England and other foreign countries where they have been exhibited. Another noteworthy place where calico-printing is practised is Jafarganj in the district of Fatehpur, where the industry is chiefly in the hands of the class of printers known as *Qalamkars*. They are so called, because, in addition to printing, they write verses, mottoes, sayings, quotations, &c., on the various fabrics they make. The writing is done as neatly at Jafarganj as in Lucknow. In fact the *Qalamkars* at Jafarganj originally came from Lucknow and settled in the Fatehpur district. The writing work at all centres is confined to *dastar khar* (table cloths), *palang posh* (bed quilts), and carpets. A great impetus to the Jafarganj industry was given by Mr Growse while Collector of Fatehpur, and his name is a household word at this day among the printers of Jafarganj.

The materials used for calico-printing are generally of three sorts, viz. :—

- (a) English cloths known as *malmal*, *nainsukh*, *lattha* or *lankilat* and *markin*. The first two are suitable for the superior, and the last two for ordinary, class of workmanship.
- (b) The very coarse native cloth called *garha* used for printing carpets known as *farsh*.
- (c) The country cloth called *gazi*, *dhoti ka jora*, or *adhotar* employed for printing *chhint* (coarse chintz) and the fabrics known as *dogha* or *galef*.

Calicoes are printed in two different styles, viz. :—

- (1) The superior *tel chol* style, in which bleaching through the agency of an emulsion made from a fixed vegetable oil and an alkali forms an important factor.
- (2) The inferior *katha* style, in which the cloth is not bleached at all.

Both classes of work are done in Lucknow and Farukhabad, but in Jahangirabad, where the *chhipis* have a sentimental feeling, associated with religious prejudices, against the practice of emulsifying oil, the *katha* style alone is printed, and there the fabrics of that style are prepared and finished in the most exquisite manner.

The industry comprises a number of different processes, most of which are combined in the printing of fabrics in the *tel chol* style, of which the following is a detailed description, the fabric known as *fard* being taken as an illustration :—

**Section A.**—The *tel chol* or *telia* style.—The material employed is generally the English long-cloth or *nainsukh*.

(1) The cloth is first cut into pieces varying from six to seven yards in length, the breadth being generally about a yard. Twenty such pieces are taken at a time.

(2) The pieces are handed over to the tanner (*tel chala*), who dips them in a mixture of finely powdered sheep, dung and water, in a large circular earthen pot (*nand*) sunk into the ground, and tramples them down with his feet, in order that the solution may be uniformly soaked by the several pieces, the weight of dung used being about  $\frac{1}{2}$  lb. for every score of pieces. The latter are then left in the vessel for the night.

(3) Next morning the pieces are passed on to the washerman (*dhobi*), who washes them simply in clear water, and, after drying, they are returned to the tanner (*tel chala*) to be bleached.

(4) Bleaching (*tel chalai* or *merai*).—A white emulsion is prepared by mixing 5 lb. to 7 lb. of castor oil (or a mixture of castor and sesamum oils in equal parts) with two ounces of a native alkali (*rassi*) in the *nand*. A small quantity (about two ounces) of powdered sheep-dung is then thrown into the emulsion and water added. The pieces are then dipped in the solution, well rubbed under the feet, and, being wrung out, they are packed together in a piece of cloth and left on the ground for three or

four days, the unused solution (*partela*), being preserved in the vessel. On the fourth day the pieces are spread out in the sun. When perfectly dry they are taken in sets of four or five at a time, again dipped in the *partela*, wrung out and exposed in the sun. This process, which is called "*ugjava*," is continued for 10 to 15 days. When the cloth becomes perfectly white on washing the process of bleaching is considered to be complete.

(5) *Second washing*.—The pieces are washed a second time in clear water.

(6) *Harni* (application of myrobalan).—The cloth being now returned to the printer, he makes a preparation (technically called *lug*) from the following ingredients, which are first powdered and then ground fine in the native mill (*chaklei*):—

Myrobalan ( <i>harra</i> )	...	...	...	...	...	2 parts.
Main	...	...	...	...	...	1 part.
<i>Terminalia bellerica</i> ( <i>bahera</i> )	...	...	...	...	...	1 part.
Flowers of <i>Grislea tomentosa</i> ( <i>dhawai</i> )	...	...	...	...	...	1 part.
Root of <i>Nardostachys jatamansi</i> ( <i>balekhar</i> )	...	...	...	...	...	1 part.
Coccaunt ( <i>khopra</i> )	...	...	...	...	...	1 part.
Root of <i>Hedichium spicatum</i> ( <i>hapur kuchri</i> )	...	...	...	...	...	1 part.
Root of <i>Cyperus peritinus</i> ( <i>nagar mothra</i> )	...	...	...	...	...	1 part.

The compound powder is, with the addition of a little water, made into balls of about  $\frac{1}{2}$  lb. each. Such balls are kept ready beforehand, and, when required, one is thrown into a vessel containing enough water to dip five pieces in.

The pieces are then plunged into the liquid, wrung out and dried in the sun. The preparation is used for the reason that the myrobalan forms a permanent black colour, with compounds of iron, subsequently used for printing.

(7) Each piece is now cut into two parts and joined so that the length of each piece becomes three to three and a half yards and the breadth is doubled. Sometimes however the breadth is shortened.

(8) *Beating (kundi)*.—The pieces are next made over to *kundigars* (clubmen), by whom they are spread on a block of wood imbedded in the ground and having a semicircular surface, and are well beaten with clubs (*mungri*). The cloth is now ready for printing.

(9) *Printing (chhapai)*.—A light convex bamboo framework called *thatia* or *tatti* is placed in a round earthen vessel called *gaddi* which contains the dye. A piece of coarse flannel is placed over the *thatia* and another piece of *markin* over the flannel, the *thatia* being sufficiently flexible to bend easily when pressed with the die, and to allow the cloth to sink to the surface of the dye liquid below. The cloth is stretched for printing on a bench (*tipai*) covered with about one or two dozen layers of some kind of coarse cloth in order to serve as a pad (*adda*). The printer sits on the ground before the small bench and holds the die in his right hand. To protect the hand from hurt he wears a leather guard (*hatthi*).

Black patterns are usually printed first. Of these the borders (*hashia*) is most important and is first taken in hand. The process is called *thekai* or *siyahi ki chhapai*.

(a) *Thekai*.—The black dye is prepared according to the following formula:—

Ferrous sulphate	...	...	...	...	...	2 lb.
Water	...	...	...	...	...	3 gallons.
<i>Dhawai ka phul</i> (flowers of <i>Grislea tomentosa</i> )	...	...	...	...	...	1 oz.
<i>Dhanmar</i> (gum of <i>Anogeissus latifolia</i> )	...	...	...	...	...	6 lb.
<i>Ghi</i> (clarified butter)	...	...	...	...	...	2 oz.
<i>Maida</i> (wheat flour)	...	...	...	...	...	1 oz.

The first three ingredients are boiled in a large copper vessel (*tabla* or *tambia*) for one hour. The fire is then put out and the decoction allowed to stand over night. In the morning it is decanted off and passed through a piece of cloth. The wheat flour and the butter (*ghi*) are then kneaded together. This preparation is then called *moi*. The gum and the *moi* are then gradually added to the decoction; the former takes about three hours' constant rubbing with the hand in order to dissolve completely.

The quantity thus prepared is sufficient for 10 to 12 scores of pieces. A small portion of the dye is then poured into the printing pot (*gaddi*). The printing block or dye is pressed on the piece of cloth overlying the frame work (*thatia*) and takes up the dye; it is then placed firmly on the cloth to be printed and given three taps from above with closed fist of the right hand. The pattern is thus printed all round in short pieces in order to make the border. Any black patterns which have to be printed in the field are printed next.

(b).—*Kattar ki datai*—(Farukhabad) or *tahrir* (Lucknow), i.e., printing outlines of patterns with red ochre.—The following receipt, which will do for 20 scores of pieces, is usually employed for making the red dye :—

Red ochre ( <i>geru</i> )	...	...	...	...	...	2 lb.
Alum	...	...	...	...	...	4 lb.
Water	...	...	...	...	...	3 gallons.
Mustard oil...	...	...	...	...	...	4 to 6 oz.
Dhaumar (gum of <i>Anogeissus latifolia</i> )	...	...	...	...	...	5 lb.

The red ochre is first rubbed with a stone in an earthen vessel together with the oil and some water. The alum is then dissolved separately in water and the solution added to the red liquid. The gum is then gradually added to the mixture and dissolved by constant rubbing with the hand. The liquid is then passed through a strainer. A portion of it is taken into the printing pot (*gaddi*) and used for printing in the ordinary manner.

(c).—The pieces are then sent to another class of washerman called *rangaia* (usually a *dhamar*) to be washed in a running stream as far as possible. This is done by fastening a rope to two pegs driven into the ground on either side of the stream, and suspending the pieces on the rope in such a manner that the running water may uniformly act upon the cloth. The pieces are then taken off, wrung out and dried in the sun.

(d).—The *rangaia* then sends the pieces direct to the *tel chala*, by whom myrobalan is again applied to them in the manner described before. The myrobalan assists the action of alum as a mordant to the madder dye used in the processes following.

(e).—*Halkari*, or printing with a preparation of turmeric on the outline called *kattar* or *tahrir*.—It is made as follows :—

Turmeric	...	...	...	...	...	½ lb.
<i>Lodh</i> (bark of <i>Symplocos racemosa</i> )	...	...	...	...	...	1 lb.
<i>Mulatti</i> or liquorice (wood of <i>Glycyrrhiza glabra</i> )	...	...	...	...	...	4 oz.
<i>Kulinjan</i> ( <i>Alpinia galanga</i> )	...	...	...	...	...	4 oz.
Alum	...	...	...	...	...	2 lb.
Water	...	...	...	...	...	3 gallons.
<i>Dhaumar</i> (gum of <i>Anogeissus latifolia</i> )	...	...	...	...	...	6 lb.
<i>Moi</i> (mixture of wheat flour and clarified butter)	...	...	...	...	...	3 oz.

The first four ingredients are finely powdered, mixed and passed through a sieve. The compound powder is thrown into the water in which the alum is previously dissolved. The gum and the *moi* are then gradually dissolved in the mixture till the latter acquires the proper consistency and is of a light green colour when ready. Printing is done in the ordinary way. The preparation used in this process serves as a mordant for the *majith* dye applied subsequently.

(f).—*Adhaiya ki rangai*, or *rangni*, or boiling the pieces in a decoction of *majith*, which is prepared according to one of the following formulæ :—

- (1) Water 80 gallons + *dhawai* flower 6 lb. + *majith* (madder) 40 lb.
- (2) Ditto + ditto + *majith* 6 lb. + European alizarin 2 lb.
- (3) Ditto + ditto + alizarin 3 lb.

The flowers, together with the powdered madder, &c., are thrown into the water, which is placed in a copper tub (*tambia* or *adhaiya*) over a fire where its temperature

risers to the boiling point. The pieces are immersed in the decoction and the boiling continued till the madder dye has become thoroughly fixed upon the portions printed with the *halkari* mixture, which then acquire a deep red colour, which is fast. During the boiling the pieces are stirred round and round in order to secure a uniform adhesion of the red dye. The pieces are taken out heaped on a wooden frame and kept till all water has trickled down, and then washed by the *dhobi* with clear water.

(g).—*Chatak* (a process of cleaning).—The pieces are again treated with sheep-dung and water by the *tel chala* (tanner.) They are then spread on the ground to dry. These two processes are repeated in succession every two to four days for about a fortnight.

(h).—*Pachaua* (also a process of cleaning).—This process consists simply in exposing the cloth to the sun for 8 to 12 days, by which any red that may have adhered to the unprinted part of the cloth is bleached off.

(i).—The pieces are next washed by the washerman with soap and dried. The ground then becomes perfectly white.

(j).—*Abi karna*—(treating with milk).—One pound of milk is poured into a large vessel containing water to which a dram of *lajward* (*Lapis lazuli*) is added. The pieces are dipped in this preparation, five at a time, wrung out and dried, the above quantity of milk being enough for 20 pieces. This process is said to impart a sort of lustre and fineness to the surface of the cloth.

(k).—*Subbhar* or *pakka nil ki datai*—(printing with a blue dye).—A round earthen vessel having a hole at the bottom is taken, a handful of straw is placed over the hole and an ordinary brick put over the straw. A mixture of 20 lb. of *rassi*, 10 lb. of stone lime and 5 lb. of shell lime is prepared, put in the earthen vessel and well pressed with a block of wood. A brick is again placed over the surface of the soda-lime, water is gradually poured thereon and allowed to filter through. The filtrate, which is of a brown colour and is called *teja*, is collected in another earthen vessel kept below.

The *teja* is a highly corrosive substance and requires careful manipulation.

For every 20 to 30 pieces  $1\frac{1}{2}$  lb. of *hartal* (yellow orpiment) and 12 oz. of *pakka desi* indigo are well rubbed together for two days in a strong earthen pot with a piece of wood called *ghonta*. Twenty pounds of the preparation called *teja* is gradually added and the liquid is then boiled in the *tabla* (a copper vessel) for two hours. In course of the boiling 5 lb. of powdered gum of *Acacia arabica* is gradually thrown into the mixture, which is removed from the furnace after it has assumed the brilliant blue colour of a peacock's neck. It is cooled down and pressed through a cloth strainer and is then ready to print with. This dye imparts a very permanent colour and is used in the ordinary way for printing over certain blanks in the black patterns.

(l).—The pieces are again washed in a stream, dried and treated with buffalo milk in the manner indicated in process (j).

(m).—*Totki ki datai*—(printing green).—For this purpose 5 lb. of powdered turmeric,  $2\frac{1}{2}$  lb. of *naspal* (pomogranate rind) are mixed with four gallons of water and the liquid is strained.

One pound of alum is then added and the liquid allowed to stand over night.

In the morning the clear water is decanted off and thrown away and with the residue are mixed 2 lbs. of *dhaumar* (gum of *Anogeissus latifolia*) and 6 drams of European Chinese blue. The preparation is then used for printing.

NOTE.—This mixture is not however commonly used now, being generally replaced by the following which is easier and cheaper to prepare:—

Water 4 pints, Chinese blue  $1\frac{1}{2}$  to 2 drams, *dhaumar* (gum of *Anogeissus latifolia*) 1 lb.

(n).—*Gulabi puria ki datai*—(or producing pink patterns).—This is done by printing with a liquid composed of European pink dye  $1\frac{1}{2}$  drams, *dhaumar* (gum of *Anogeissus latifolia*) 4 oz., water 3 pints. The colour obtained is fleeting.

(o).—*Zardi ki datai*.—Patterns to be printed yellow are next taken in hand, the yellow dye being prepared by one of the following methods :—

(1) Turmeric  $\frac{1}{2}$  lb. boiled with 3 pints of water and 4 oz. of *dhaumar* gum added.

(2) *Tesu-ke-phul* (flower of *Butea frondosa*)  $\frac{1}{2}$  lb. boiled with three pints of water. The decoction is thickened with a mixture of—

Lime	...	...	...	...	...	2 oz.
Alum	...	...	...	...	...	1 oz.
<i>Dhaumar</i> gum	...	...	...	...	...	4 oz.

(10) *Chune ki chhapai*—(application of resist paste).—Before applying ground colours to the printed cloth the patterns are coated with a preparation of lime (resist paste) in order to protect them from the action of the ground colour. And the resist paste (*matti*) is usually applied before the patterns in fleeting colours are printed. Thus in a case of the printing just described the application of resist paste must invariably precede the processes (*m*), (*n*) and (*o*), in all of which the colours produced are fugitive.

The resist paste is prepared in the following manner :—

Four pounds of shell-lime is dissolved in water and the liquid kept at rest for some time. The surface water is then decanted off and the sediment passed through a piece of muslin. Half a pound of soap, 2 lb. of *dhaumar* (gum of *Anogeissus latifolia*), and 12 lb. of gum *acacia* are then dissolved in it with the addition of a little water.

The printed patterns are then stamped over with this preparation and a line is drawn with it to mark the boundary between the ground and the borders which are dyed differently.

11. *Zamin ki rangai or putai*—(application of ground colour).—This is done by rubbing the prepared dye liquid with a piece of flannel or longcloth over the printed fabric. The colour in the field is usually different from that on the borders. Some times the field is divided into four equal parts and each part is rubbed over with a different colour. A fabric dyed in this style is called *chār āgh*.

The following are the colours most commonly applied :—

*Basanti*—(Sulphur yellow).—

(a) *Asbarg* (*Delphinium ajacis*) 10 lb. is boiled in four gallons of water; when  $\frac{1}{2}$  of the water has evaporated the decoction is strained, cooled down and used for rubbing. The cloth is then dried. The refuse left in the boiler is again boiled in three gallons of water and when about half the quantity has evaporated the decoction is taken down and strained. Alum is then added to it in proportion of 12 drams for each piece (*fard*) and the decoction then (a second time) applied to the cloth.

(b) Turmeric 1 lb. is pounded, steeped in 5 pints of water and passed through a strainer. Half a pound of curdled milk is then added and the mixture rubbed over the cloth.

*Khāki*—(grey).—Babul pods from which seed has been removed are pounded, steeped in water and the infusion passed through a fine piece of cloth. The liquid is applied to the cloth twice. Before the second application a little alum is added to the liquid.

*Gulabi*—(pink), *Chehrai* (light pink).—For these two shades infusion of madder of different strengths is used, and it is applied twice, alum being dissolved in the liquid before the second application.

*Sabz*—(green).—Two lbs. of turmeric is pounded and moistened with water. The mass is then ground on a piece of stone (*sil*) and passed through a strainer. *Naspāl* (pomegranate rind) 1 lb. pounded, ground and passed through a sieve is mixed there-with and 3 drams each of the European grey and green aniline dyes are added.

*Asmāni or nila*—(sky blue or light blue).—The mixture used in the superior kind of *nil ki datai*, described in paragraph 9, sub-section (b), is dissolved in water, and a strong or weak solution applied to the cloth according as the shade required is *asmāni or nila*.

*Fakhtai*—(dove grey).—European violet dye  $2\frac{1}{2}$  drams is mixed with an infusion of 1 lb. of madder (*majith*) sufficient to dye 20 pieces. The dye is applied twice, alum being added to the liquid before the second application.

*Pistai*—(yellow green).—The dye liquid is prepared from a decoction of ground turmeric and *naspal*, each  $\frac{1}{2}$  pound, European green aniline dye  $1\frac{1}{2}$  drams. Some alum is added before the second application.

*Malagiri*.—*Tesu* flowers (*Butea frondosa*)  $2\frac{1}{2}$  lb. are steeped in water in an earthen pot for 8 days, and stirred once or twice daily. One pound of powdered *naspal* is similarly steeped in water. The two infusions are strained separately and then mixed together. Half a dram of green aniline dye is added to the mixture. This mixture is also applied twice, the second application being done after the addition of alum.

*Naranji* (orange).—The dye for this colour is prepared in the following manner:—

(a) By steeping  $1\frac{1}{2}$  lb. of turmeric and two ounces of *majith* (madder) in water and straining the liquid.

(b) By dissolving some yellow or red European dye in an infusion of turmeric.

*Surkh* (Red).—Prepared by steeping 6 lb. of madder and  $1\frac{1}{2}$  lb. of alum in 6 gallons of water.

*Sabz dhani* (dark green).—Prepared by mixing ground turmeric  $3\frac{1}{2}$  lb., indigo 6 ounces, and alum 2 lb. with water.

*Purple*.—Madder *majith*  $2\frac{1}{2}$  lb. and indigo 1 ounce mixed in 3 gallons of water, or madder 4 lb., indigo  $\frac{1}{2}$  ounce, mixed in 3 gallons of water. The latter mixture forms the colour known in vernacular as *kopli* and is twice applied,  $1\frac{1}{2}$  lb. of alum being dissolved in it before the second application.

12. *Dhulai*—(washing).—The application of ground colours being over, the cloths are sent to the tanner, by whom they are washed in running water in order to take off the resist paste.

13. *Kundi*—(clubbing).—The pieces are next folded and clubbed smooth by the *kundigars* (clubmen).

Section B. —*The Katha style*.—Printing of calicos in this style is by far the most common everywhere, being less elaborate and less expensive. The main difference between this and the *telchol* printing described before is that in case of the former (a) the process of bleaching the cloth is completely dispensed with, and (b) the dye liquid for printing black patterns is, though not always, a preparation of acetate of iron, instead of sulphate of iron, the acetate being prepared by a cheap and simple process known as *lukkar* in the following manner:—

Scrap iron	...	...	...	...	...	...	80 lb.
Gur	...	...	...	...	...	...	8 lb.

are thrown into a vessel containing about 8 gallons of water and allowed to stand for a week, the liquid being stirred with a wooden stick two or three times a day. Sixty pounds of powdered myrobalan are then mixed with the liquid, and the latter left undisturbed for a month. The mixture is then boiled in a copper vessel (*Tambia*) and when about half the quantity of water has evaporated, it is taken down, passed through a strainer, and the strained liquid again kept at rest till it is no more turbid. The clear liquid is then decanted off and gum of *dhaumar* (*Anogeissus latifolia*) dissolved in it, in proportion of 1 lb. of gum to a gallon of the liquid. Two pounds of *gur* and one pound of indigo are then added. The mixture is then ready for printing. At Jahangirabad the iron liquor is prepared without the addition of myrobalan and indigo.

*Printing in the katha style.*—The processes of printing a *lihaf* in the *katha* style as carried on at Jahangirabad are as follows:—

- (1) Cloth washed.
- (2) Starch removed completely by dipping the cloth in a mixture of *reh* and water, and, when dry, boiling it in a copper vessel full of water and again washing it.
- (3) Myrobalan applied as in the case of the *telchol* style described before.
- (4) Black patterns printed on the borders and in the field with the iron mixture described above (page 50).
- (5) Outlines of patterns printed with a mixture of red ochre as in the case of *telchol* style (see *kuttar ki datai*, page 47).
- (6) Red patterns printed (see *gulab* or *halkari* under *telchol* style, page 47).
- (7) Boiled with *majith* as in *telchol* style.
- (8) Treated with buffalo milk and water (see *abi karna*, page 48).
- (9) Patterns printed green with a mixture prepared as follows:—

Turmeric	...	...	...	...	...	2 lb.
Pomegranate rind	...	...	...	...	...	1 lb.

ground with water separately, passed through a strainer and the two solutions mixed together. Four ounces of indigo is then rubbed into this mixture and one ounce of alum +  $\frac{1}{2}$  of *dhaumar* gum added.

- (10) The green patterns are again stamped over with the following mixture:—

Catechu	...	...	...	...	...	3 oz.
Myrobalan	...	...	...	...	...	$\frac{1}{2}$ lb.
Pomegranate rind	...	...	...	...	...	$\frac{1}{2}$ lb.
Ferrous sulphate	...	...	...	...	...	4 oz.
Iron solution ( <i>lakkar</i> ) described on page 50	...	...	...	...	...	3 gallons.

The ingredients are boiled together, and when  $\frac{1}{3}$ rd of the water has evaporated the mixture is taken down, cooled and thickened with  $1\frac{1}{2}$  lb. of *dhaumar* gum (*Anogeissus latifolia*).

The following is a detail of the cost of printing 3 scores of *lihaf fards* by the foregoing method, each piece being 3 yds.  $\times$   $1\frac{1}{2}$  yd:—

						Rs.	a.	p.
Cloth	...	...	...	...	...	45	0	0
Application of myrobalan	...	...	...	...	...	0	9	0
Materials for printing	...	...	...	...	...	10	2	0
Fuel for boiling water	...	...	...	...	...	0	4	0
Washing	...	...	...	...	...	1	0	0
Printing charges	...	...	...	...	...	8	0	0
Clubbing	...	...	...	...	...	0	6	0

In the manufacture of Jahangirabad curtains and table cloths the various processes up to boiling the pieces with *majith* are carried out in the order in which they have been described above, with reference to the printing of a *lihaf* in the *katha* style. The fabrics are then washed, dried and dipped in a decoction of flowers of *harsinghar* (*Nyctanthes arborescens*) which imparts a beautiful but fleeting yellow ground colour, about 5 lbs. of flowers being sufficient to dye 20 curtains. Occasionally aniline dyes are also used to produce different ground colours of a more or less fleeting character. A permanent shade of yellow (*badami*) is produced by dyeing the piece immediately after application of the madder dye in a weak infusion of myrobalan (*Terminalia chebula*).

Any patterns that have to be printed in fleeting colours (and their number depends upon the printer's will) are printed next, the dye liquid being usually prepared by mixing a solution of *dhaumar* gum with the aniline dye employed in each case.

The curtains are then beaten with clubs to make them smooth. Starch is usually mixed with the solution intended for the ground colour.



The cost of printing 100 curtains, each 3 yds. × 2 yd., is as under:—

	Rs.	s.	p.
Cloth	112	8	0
Myrobalan, 10 lb.	0	10	0
Black dye liquid	1	0	0
Red ditto	0	12	0
Majith (madder), 10 lb.	6	0	0
Harsinghar flowers 20 lb.	6	0	0
Starching	0	5	0
Chatkai (washing)	1	0	0
Printer's charge	9	6	0
Clubbing	0	10	0
Total	188	3	0
Market value of 5 scores	162	0	0
Difference (manufacturer's profit)	23	13	0

**Section C.—Zarde ki chhapai.**—This is a very plain style of printing done pretty largely in almost all calico-printing centres. The *chhipis* engaged on it confine themselves to this class of work only.

The fabrics printed are generally handkerchiefs, *sáris*, *dhotis* and *dupattas* made of muslin, *nainsukh* or *lankilat* (long-cloth).

Ordinarily the cloth is not washed before printing. The dye liquid used is prepared by boiling  $\frac{1}{2}$  lb. of ferrous sulphate in 32 oz. of water for 10 minutes and adding 6 oz. of *dhaumar* gum to the solution. The patterns are printed with the liquid and the cloth exposed to the sun, when prints acquire a permanent yellow colour.

At Farukhabad the wages for printing a piece 20 yards long and  $1\frac{1}{16}$ th yard wide in this style vary from 7 to 8 annas. At Jahangirabad a slightly deeper colour (*kathhai*) is produced by dipping a cloth printed in the above manner in an alkaline preparation made as follows:—

Crude carbonate of soda ( <i>sajji</i> )	...	...	...	...	2 lb.
Lime	...	...	...	...	$\frac{1}{4}$ lb.

are thrown into a vessel containing  $1\frac{1}{2}$  gallons of water and the mixture is allowed to stand for 12 hours. The clear liquid is then decanted off and the cloth soaked in it and exposed in the sun.

**Section D.—Kali siyahi ki chhapai or papri ki chhapai.**—This style was introduced only a few years ago, and consists in printing cloth with a permanent black dye composed chiefly of certain chemicals imported from Europe. The chief fabrics printed are *dhoti*, *sári*, *rumál* and *dupatta*, and the cloth used is almost always English made *muslin*, *nainsukh* or *lattha*. The dye liquid is prepared as follows:—

Sal ammoniac	...	...	...	...	2 oz.
Chlorate of potash	...	...	...	...	1 oz.

are dissolved in two ounces of water and the solution warmed. Two drams of wheat-flour are then added, and the liquid poured into a solution of 6 oz. of *dhaumar* gum and 32 oz. of water. Two ounces of *papri* (\*printing black) and 1 oz. of copper-sulphate are then dissolved in it. This mixture is then utilised for printing the patterns on unwashed cloth. The latter is then left for a day to dry thoroughly, and is then dipped in lime water, wrung out and dried. The prints then acquire a deep permanent black colour.

Sometimes patterns in yellow colour (*zarde ki chhapai*), described before under Section C, are also printed on the cloth printed in this style.

**Section E.—Printing "chhint" (chintz).**—Chintzes printed by the native manufacturers are generally of inferior quality, and are used only by village women and females of poorer classes for petticoats, *lahngas* and *pharias*. In Lucknow however the calico-printers are quite capable of producing chintzes of very superior quality,

\* A white crystalline substance manufactured in Germany.

but the cost of their manufacture is so high that they cannot compete with European fabrics in the market, and this is the main reason for absolute want of advancement in this branch of the calico-printing industry.

The only part of Northern India in which there is anything like a fair demand for chintzes of native manufacture is Nepal, and almost all the *better classes* of chintz made at Farukhabad, Tanda (Fyzabad) and other places are therefore sent up to Nepal for sale. Certain printers in Farukhabad receive patterns direct from the Raj with orders. Until 15 years ago two kinds of chintz, namely *bund-udi* and *karila*, were largely manufactured in Farukhabad, but have gradually been supplanted by cheap European chintzes, which are in greater favour with the public at large. They are only sparingly made now, and a complete description of their manufacture will be found on pages 58 and 59 of "Dyes and Tans" by Sir E. C. Buck. These two fabrics are however so rarely made now as hardly to deserve notice in detail.

At Jahangirabad two coarse varieties of chintz are commonly manufactured. They are :—

(1) *Bainjani bund*.—Used for potticoats chiefly by poor Bráhman females. The material used commonly is *garha*, which sells at  $1\frac{1}{2}$  to  $2\frac{1}{2}$  annas per yard.

*Processes of manufacture.*

- (a) Cloth washed.
- (b) Myrobalan applied.
- (c) Printed with the following mixture :—

Red ochre	...	...	...	...	...	...	$\frac{1}{2}$ lb.
Water	...	...	...	...	...	...	3 gallons.
Alum	...	...	...	...	...	...	$\frac{1}{2}$ lb.
Dhaumar gum (gum of <i>Anogeissus latifolia</i> )	...	...	...	...	...	...	$1\frac{1}{2}$ lb.
Moi (ghí and wheat flour)	...	...	...	...	...	...	$\frac{1}{2}$ lb.

(d) Coloured with *majith* (as described on page 47).

(e) Washed.

(f) Resist paste (*dawab*), made by mixing the following substances, applied :—

Dhaumar gum	...	...	...	...	...	...	$2\frac{1}{2}$ lb.
Lime	...	...	...	...	...	...	2 lb.
Bighan (flour of weeviled wheat)	...	...	...	...	...	...	10 lb.
Water	...	...	...	...	...	...	9 gallons

(g) Dipped in indigo by the *rangrez* to make the ground purple.

(h) Immersed in water and kept there for three hours in order to remove the resist paste.

(i) Washed.

(j) Starched.

(k) Beaten smooth with clubs.

The following is a detail of the cost of manufacture :—

						Rs. a. p.
Price of piece 10 yards long	...	...	...	...	...	1 4 0
Washing	...	...	...	...	...	0 1 0
Printing	...	...	...	...	...	0 1 6
Dyeing with indigo	...	...	...	...	...	0 2 6
						<hr/>
Market price of the printed piece	...	...	...	...	...	1 9 0
Manufacturer's profit	...	...	...	...	...	1 12 0
						<hr/>
						0 3 0

(2) *Zarda*.—A very inferior quantity of chintz used almost entirely by women of the *chamar* caste.

The material employed is very coarse *garha* worth about  $1\frac{1}{2}$  anna per yard.

The piece is first washed, then dipped in the myrobalan mixture, taken out, dried and black patterns printed thereon. The cloth is boiled in a *tambia* (copper vessel) in the following mixture :—

European red dye labelled "Congo, Red 6 B." ...	...	...	1 lb.
Soda carbonate ... ..	...	...	2 oz.
Water ... ..	...	...	40 gallons.

The cost of manufacture is very low, being about 1 anna per 12 square yards. A piece of this fabric 8 yards long and  $\frac{2}{3}$  yard wide will sell for 14 annas.

A better kind of *chhint* called *phohardār* is manufactured at Jahangirabad and sold at 2½ to 3 annas per yard, the liquid used for printing being the one described under *kali siyahī ki chhapai*, page 52, and the patterns composed of plain round dots. The ground is generally white.

**Section F.—*Khema ki chhapai.*—**(Printing of materials for lining tents).

This industry is carried on chiefly at Fatchgarh and in Lucknow. The cloths used are :—

(1) *Desi garha*. (2) *dhoti*, (3) Cawnpore made American drill, (4) *dosuti*. The piece to be printed is first dipped in a mixture of sheep dung and water; next the starch is completely removed by washing it with clear water. The cloth is then dyed yellow in a solution of *multani mitti*, the process being technically called *ram raj* or *multani karna*. The piece is not however wrung out after dyeing in order to avoid appearance of stains on the material. One and a half pound to two pounds of *multani mitti* is sufficient for a piece of 12 square yards. The cloth is then dried and washed a second time.

*Printing.*

(1) *Datai kattha*—(printing brown pattern).—For every 5 scores of pieces each 12 yards long the printer takes :—

Catechu	...	...	...	...	...	... 2½ lb.
Shell lime	...	...	...	...	...	... 2½ lb.

The catechu is boiled and the decoction strained. The lime is thrown into half a gallon of water, stirred, and the liquid allowed to stand. The clear lime water is decanted off and added to the decoction of catechu. *Dhauumar* (gum of *Anogeissus latifolia*) is then dissolved in the mixture, which is then passed through a strainer and used for printing.

(2) *Dalai sabzi*—(printing green patterns).

Turmeric	...	...	...	...	...	2 lb.
Dhaumar gum	...	...	...	...	...	4 lb.
Gatti ( <i>pakka indigo</i> )	..	...	...	...	...	1 lb.

The turmeric is pounded and mixed with three gallons of water. *Dhaumar* is dissolved in the liquid, and the mixture is passed through a strainer. Indigo is then rubbed in lime water and mixed with the above preparation. The dye is then ready for stamping. The printing of black patterns is technically called *bhant* and of other patterns *datta*.

Almost all tent fittings, including *farsh* (carpet), are printed in the above style. The cost of printing one score of pieces each 12 yards  $\times$  1 yard is as follows:—

The wages of tanner	...	...	...	...
Ditto of washerman	...	...	...	...
Ditto of printer	...	...	...	...
				10 8 0

Should the printer wish to produce patterns in other colours he would use the different printing liquids mentioned before.

**Section G.—Printing in gold and silver leaf.**—The real gold or silver leaf is printed on coloured cotton fabrics, for use in *palki* coverings, *pardahs*, *lihafs*, *patkas* *toshaks*, &c. The *chhipis* at Jaunpur prepare the printing mixture as follows :—

Gum arabic	...	...	...	...	...	4 oz.
Beroza	...	...	...	...	...	2 oz.
Chalk	...	...	...	...	...	2 oz.

are boiled together in 16 oz. of water, till the mixture is reduced to  $\frac{2}{3}$  of its original bulk. Another mixture is then prepared by boiling 4 oz. of *methi* (fenugreek, *Trigonella foenum-graecum*), with 4 oz. of water, the refuse being thrown away after boiling. The two preparations are then mixed together to form the printing liquid. The patterns on the fabrics are stamped with this mixture with wooden dies in the ordinary way. A pad made of cotton wool tied loosely in a piece of cloth is placed on strips of silver or gold leaf. The strips stick to the pad and are then laid over the patterns traced in the above manner. The leaf adheres to the gummy lines of the patterns stamped and comes away from the unstamped surface. The cloth is then rubbed over with an instrument called *duali* which gives a brightness to the metal.

**Section H.—Printing an imitation of silver.**

Tin foil	...	...	...	...	...	8 oz.
Glue	...	...	...	...	...	2 oz.

are pounded together with a little water. The mass is then boiled in a pint of water and *dhaumar* gum 4 oz. is then dissolved in the liquid. The *chhipi* takes a small quantity of this mixture by means of a bamboo spatula (*patti*) on the palm of his left hand. The stamp is first applied to the liquid on the palm and then pressed on the fabric. When all patterns are printed in this way, the cloth is dried and rubbed over with the *duali* (see description of implements, Appendix A), which imparts a brilliant lustre to the prints and a gloss to the cloth.

The following is a detail of cost of printing four *dupattas* each  $2\frac{1}{2} \times 1\frac{1}{2}$  yard :—

						Rs. a. p.
Cloth	...	...	...	...	...	2 8 0
Dyeing red	...	...	...	...	...	0 6 0
Tin foil 1 lb.	...	...	...	...	...	0 11 0
Glue	...	...	...	...	...	0 1 0
<i>Dhaumar</i> (gum of <i>Anogeissus latifolia</i> )	...	...	...	...	...	0 1 6
						<hr/>
						3 11 6
Market price...	...	...	...	...	...	4 4 0
Manufacturer's profit	...	...	...	...	...	0 8 6

Time required for printing, &c., 2 days.

**Section I.**—The following is a list of the principal fabrics manufactured by *chhipis* at the four main centres of calico-printing, namely Lucknow, Farukhabad, Fatehpur and Jahangirabad, and it may safely be stated that the various particulars given in the list apply also to the fabrics made in other districts of the United Provinces:

Name of district where chiefly manufactured.	Name of fabrics.	Purpose for which used.	Material.	Length and breadth.	Average cost of manufacturing 20 pieces including price of cloth.	Charge of 20 pieces.	Remarks.
LUCKNOW.	Fard, tela	To make a day covering for use in the cold weather.	Markin and long-cloth.	3x1½	Rs. 20	Rs. 25	
	Ditto	Ditto	Nainsukh	3x1½	25	30	
	Ditto superior or quality.	Ditto	Ditto	3x1½	30	40	
	Lihaf	To make a night covering in cold weather.	Markin and long-cloth.	3x1½	27	30	
	Ditto	Ditto	Nainsukh	3x3½	30	35	
	Palang posh	For covering bed	Markin and long-cloth.	3x2	27	30	
	Ditto	Ditto	Nainsukh	3x2	30	35	
	Fard kathia	Day covering in cold weather.	Markin and long-cloth.	3x1½	17	20	
	Ditto	Ditto	Nainsukh	3x1½	20	25	
	Lihaf and palang posh.	Purposes noted above	Markin and long-cloth.	3x1½ and 3x2	25	30	
FAIRKANABAD.	Ditto	Ditto	Nainsukh	3x1½ and 3x2	28	35	
	Chhint of different patterns.	Ditto	Ditto	3x1½ and 3x2 4 yds. x 27 inches	25	28 to 30	
	Bund udi	For petticoats of village women.	English cloth Cawnpore made.	5½ yds. x 38 inches	22	25	
	Kasila	For petticoats worn in marriage festivities.	English long-cloth.	6 yds x 1 yd.	19	20	
	Lihaf	Night covering in cold weather.	Nainsukh and markin.	3 x 2	36-8	40 to 45	
	Toshak	Mattress	English long-cloth	2½ x 1½	40	42-8 to 45	
	Doga	Night covering in the cold weather.	Country garla	2½ x 1½	24-4	28-8	
	Fard	A day covering in the cold weather.	Long-cloth	3x1½	29	30	
	Chhint monai	Fundle dress	Country cloth	8x1	25	26-4	
	Palang posh	For covering bed	English cloth	3x2	25-3	40 to 45	
	Chhint zarda	For tents	Garla	8 yds. x 12½ inches	25-3	36 ½	

JAHANGIRABAD (BUTANDSHAHIR).		JAHANGIRABAD (FARUKPUR).				
Palang posh Janamaz	For covering bed Used as a carpet by Mus- hammadans while saying prayers.	English markin .. Ditto ..	3x2 yd. 1x1 yd.	50 20	100 30	Only sold when spe- cially ordered.
Dastarkhan	Spread on the floor and food served on it.	Ditto	1x1 yd.	20	30	Made to order, not sold.
Shamianah	Tents	Country cloth	...	...	...	
Table cloth	To spread on table	Markin	2x1 yd.	40	80	
Tohak	Mattress	Garha	2 1/2 x 1 1/2	17-8	22-8	
Doga	To make night covering in the cold weather.	Ditto	3x1 1/2 (double)	23-12	25	
Farsh	Carpet	Ditto	...	...	...	
Lilaf	Night covering in cold weather.	Garha	3x2	18 to 27	20 to 30	
Ditto	Ditto	Latha	3x2	20 to 30	25 to 35	
Ditto	Ditto	Markin	3x2	20 to 25	25 to 32-8	
Pardah	Curtain	Muslin, nainsukh and latha.	3x2, 3x1 1/2 4x2, 4x1 1/2	35 to 60	40 to 70	
Palang posh	For covering bed	Ditto	3x2	25 to 30	30 to 40	
Fard	A day covering in the cold- season.	Ditto	3x1 1/2	20 to 25	22-8 to 30	
Mez posh	Table cloth	Ditto	1 1/2 x 1 1/2, 2x2	25 to 30	30 to 40	
Diwalgiri	Used for walls in the same way as paper in Europe.	Ditto	18 yd. x 18 yd.	80 to 112	90 to 127	
Janamaz	Used as a carpet by Mus- hammadans while saying prayers.	English garba and nainmal.	45 inch. to 27 inches	5 to 10	7-8 to 12-8	
Dastar Khan	Spread on the floor and food served on it.	Garha, nainmal and markin.	1 yd. x 1 yd.	Rs. 5 to Rs. 6-4-0	Rs. 6-4-0 to Rs. 7- 8-0.	The cost of manufacture comes to Rs. 0-4-6 per sq. yard and the price to 5 annas. The cost of printin g is 1 anna per sq. yard. Ditto.
Chandani	Carpet	Cawnpore made garha.	...	...	...	Cost and charge as in case of chandni. Cost 3 1/2 annas to 5 annas, charge 4 to 6 annas per yard. The cost of printing is one anna per square yard.
Chhat	Used as ceiling cloth	Malmal, nainsukh and tanzob.	...	...	...	
Dopatta	Used for covering the body from head down to waist.	Malmal and tan- zeb.	3x1 1/2	...	...	
Ramal	Handkerchief	Ditto	18 inch sq. to 36 inch square.	Rs. 1-14-0 to Rs. 4- 4-0.	Rs. 2-8-0 to Rs. 5.	
Jajim.	Carpet	Garha and dosuti	...	...	...	
Jhalar pankha	Fringes for the pankha	Malmal and nain- sukh.	38 inch breadth	...	...	
Doga or Galaf	Night covering in the cold weather.	Gazi	3x2	Rs. 18 to Rs. 30	Rs. 20 to Rs. 35	
Sari	Used for petticoats	Malmal nainsukh and tanzib.	6 yds. 45 inch.	...	...	

## CHAPTER VI.

## TANNING AND DYEING LEATHER.

At the present date the business of tanning and dyeing leather, on purely native principles, is not carried on to any large extent anywhere in these Provinces. The introduction of the European methods of dyeing and tanning leather and the establishment of factories in Cawnpore and Agra have led to a gradual decline of the native industry. The latter, however, still exists in many districts, notably Cawnpore, Lucknow, Fyzabad, Agra, Sahāranpur and Aligarh. The following is an account of the various native methods of leather manufacture. The process of tanning leather in most of the districts is carried on as follows:—

The skin is soaked in water for one day and then plunged into an earthen vessel (*nānd*) buried in the ground and containing a solution of lime and *sajji*. It remains in this vessel for 10 or 12 days till the hair begin to fall off; then it is taken out and cleaned with a sharp instrument called *ranpa*, washed and again immersed in a fresh solution of lime and *sajji* for two days, after which it is taken out and the fatty tissues carefully scraped off. After this the hide is steeped for one day in summer, two days in the rainy season and five days in the cold weather in a preparation called "*kunga*," which means old tanning liquor, made by infusing *babul* bark, then immersed in a *nānd* containing an infusion of *babul* bark, in which it is allowed to remain for two or three days, being occasionally stirred and turned round. Then it is taken out, and squeezed on a log of wood buried diagonally in the ground by means of a wooden roller, about half a yard in length and four inches in circumference. The hide is then soaked in three successive *nānds* containing the above infusion of *babul* bark, remaining in each *nānd* for three days. After it has been taken out from the third *nānd*, it is roughly sewn into a bag with *moonj* grass (*Saccharum mungo*). The bag is filled with pounded *babul* bark and hung up on poles, water being poured into the bag and allowed to filter through for three days. The bag is then turned inside out and is refilled with *babul* bark and otherwise treated in the same manner as before. The hide is again steeped in *babul* bark infusion for 15 days during which fresh bark is added twice or thrice and the old bark thrown away. It is then taken out, the inner side rubbed over with *khari* salt and dried. This process gives a *badami* (buff) colour. The process differs a little at Fatchpur, where, the bag when it has undergone the double process of filling with *babul* bark and filtering, the *moonj* sewing is opened out and the leather washed in clear water. *Khari* salt and *kanna* of rice are then well rubbed on the skin which is then allowed to dry. When it is dry water is sprinkled with a *jharu* (broom) and the skin is scraped with a *khelua* made of wood and a *hasia* in order to give it a polish. The process described above is chiefly used for tanning and dyeing skins of buffaloes and cows. Skins of sheep and goats are tanned in the same way, with this difference that it is not necessary to sew them up and the operation of soaking them in the various *nānds* does not take so much time.

*Dyeing black.*—The tanned leather is moistened with water and rubbed with *jhanwan* for four hours and the water squeezed out.

Gout's fat ...	...	...	...	...	...	1 lb.
Sesamum oil	...	...	...	...	...	$\frac{1}{4}$ lb.

are boiled together and the leather smeared with the mixture. Before the leather is completely dry, it is again rubbed with *jhanwan* for an hour and is then ready to receive the dye.

Myrobalan	...	...	...	...	...	8 oz.
<i>Terminalia bellerica</i> ( <i>bahera</i> )	...	...	...	...	...	8 oz.
Anila fruit ( <i>Phyllanthusemblica</i> )	...	...	...	...	...	8 oz.
Green vitriol	...	...	...	...	...	2 oz.
Onions	...	...	...	...	...	8 oz.
Gur (molasses)	...	...	...	...	...	1 lb.
Iron	...	...	...	...	...	1 lb.

are boiled in one gallon of water, and when  $\frac{3}{4}$  of the whole has evaporated the decoction is applied to the leather with a brush and the leather rubbed over with mustard oil. The quantity of decoction obtained from the above mentioned weights of the various ingredients is sufficient to dye 10 pieces of leather (bullock hide).

Yellow is dyed with a decoction of *tān* flower. The colour becomes fast if a little *shanjarf* (cinnabar) is put in while boiling the flowers.

Red colour is dyed either with the red European dye or a decoction of *patang* (sappan wood). The hide is either steeped in the dye solution or the dye is applied with a brush. The skin of buffaloes is generally used for making soles of shoes and boots, harness and saddlery. Calf leather is used for making boots and shoes and well-buckets. Scabbards and *mashaks* are made of goat skin. The following is a detail of cost of dressing 12 skins of buffaloes or cows :—

	Rs.	a.	p.
Cost of raw hides at Rs. 4 each	...	...	...
Lime 30 seers	...	...	...
Scuff 2 seers	...	...	...
Scraping 6 pies per hide)	...	...	...
Babul bark, 2½ mds.	...	...	...
Maony ½ lb for each hide	...	...	...
Khari salt 1½ lb for each hide	...	...	...
Miscellaneous labour	...	...	...
	Rs.	55	6 6
Price of 12 hides (dressed)	...	72	0 0

*Safeda*.—The following operations are carried on in Lucknow in the manufacture of the white leather known as "*safeda*" :—

- (1) Goat skin steeped in lime water for 24 hours.
- (2) Hair scraped off with a *ranpa*.
- (3) Again steeped in lime water for 15 to 20 days.
- (4) Surface again cleared with a *ranpa*.
- (5) Immersed in clear water for 3 days.
- (6) Steeped for three days in a gruel made from barley meal.
- (7) Washed.
- (8) Process No. 6 repeated.
- (9) Washed and squeezed.
- (10) Steeped for three days in a solution of *khari* salt.
- (11) Taken out and dried without being squeezed.
- (12) Moistened again with water.
- (13) Folded and kept between layers of a blanket for 12 hours.
- (14) Benten against a wall or the trunk of a tree and rubbed with hand.
- (15) The last two processes are repeated three times. The following is a detail of cost of dyeing 40 skins :—

	Rs.	a.	p.
Lime	...	0	4 0
Barley gruel	...	0	10 0
Khari salt	...	0	5 0
Washing	...	0	4 0
Scraping hair	...	0	5 0
Cleaning the hides	...	0	8 0
Wages of coolies	...	0	12 0
Total		3	0 0

A dyed skin sells from 8 to 10 annas in the market.



Manufacture of *desi barnish* (country varnish).—Sheep or goat skin is steeped in water for two hours. It is then taken out and the hair is scraped off.

<i>Dhai</i> (curd)	...	...	...	...	...	16 lb.
<i>Kharj</i> salt	...	...	...	...	...	1 lb.

are mixed with two gallons of water and the mixture stirred thoroughly. The skin is then steeped in the mixture for a whole night, taken out in the morning, squeezed and dried.

It is then moistened with water, beaten on a plank of wood and dried in the shade. Before it is completely dry it is trampled by the feet and then rubbed with the hand in order to make the surface perfectly even. The skin is then stretched on a plank of wood to which it is nailed down. It is then ready to be varnished.

<i>Nil vilatti</i> , (Chinese blue)	...	...	...	...	2 oz.
<i>Kajal</i> (soot)	...	...	...	...	2 oz.
Linseed oil...	...	...	...	...	3 lb.
<i>Ral</i> (a resinous substance)	...	...	...	...	1 oz.
Oxide of zinc	...	...	...	...	12 lb.

are mixed together. The mixture is boiled for 4 hours and passed through a cloth strainer. It is then rubbed over the skin, which has been moistened with a solution of green vitriol, till it has turned black and the skin exposed to the sun to be dried. In the evening it is rubbed with a *jhanwan* (an over-burnt piece of clay) and the next morning the mixture is applied again.

These processes are repeated daily for a week when the varnishing is supposed to be complete. The leather is then taken off the board. A varnished goat skin sells for 10 to 12 annas.

*Kimukht* (shagreen).—This is a kind of green leather prepared usually from the skin of the hind quarter of horses or asses. The hide is cut into two, the posterior half alone being used for manufacturing shagreen. The skin is steeped in water for a day and fatty tissues scraped off by an instrument called *dasi*. It is again steeped in water for an hour, taken out and stretched on a frame and the hair completely removed. It is then spread on the ground and nailed down with pegs, care being taken that there should be no wrinkles on the skin. A comb-shaped instrument called *arra* is passed over the hide whereby it slightly swells and becomes white. A pound of *sawan* (*Panicum frumentaceum*) seed is spread on the skin and forced into it by trampling down. The seeds are allowed to remain on the hide in the sun for a whole day and then they are shaken out, leaving the surface indented. Two gallons of water is then boiled and 1 lb. of *khari* salt dissolved in it. The hide is immersed in this solution and boiled for ten minutes when it is considered to be ready to receive the dye.

Copper filing	...	...	...	...	...	$\frac{3}{4}$ lb.
Salammbiac	...	...	...	...	...	$\frac{1}{4}$ lb.

are mixed and rubbed with water on the hide. The skin is then folded and placed between two thick layers of grass and allowed to remain in this state for a night. In the morning the skin is taken out and folded in such a manner as to bring into immediate contact with grass those layers which were not in such contact before and the skin is placed again in grass as before. The transposition of layers in this manner goes on for three or four days. The copper mixture is applied to it in the same way and the subsequent processes continue for eight days. When the colour is uniform and granulations perfectly formed it is dried in the sun and the skin washed off to get rid of the copper solution. *Khari* salt is then applied to the opposite side and *ghs* on the granulated surface, and the leather is then spread out in the sun. When dry it is rubbed with the hand till it is smooth.

The granulations appear only on the skin of the buttock and not on the whole skin. The part of the skin on which such granulations do not appear is cut off and is called *kurkni*.

The following is a detail of cost of making shagreen from one skin :—

	Rs.	a.	p.
<i>Khari</i> (salt) . . . . .	0	0	6
Copper . . . . .	0	6	0
Salomonlac . . . . .	0	7	0
Seeds . . . . .	0	0	6
<i>Ghi</i> . . . . .	0	0	6
Miscellaneous labour . . . . .	0	4	0
Total.	1	2	0

It sells for Re. 1-8-0 to Rs. 2-0-0 according to quality.

Dyeing *nari* (red leather).—Crudo lac 5 lb. is taken and ground on a slab and steeped in water for a whole day in an earthen vessel (*nānd*). The lac is then rubbed with the hand in the vessel to yield colour, water being gradually added in small quantities while rubbing. The liquid is then strained and the refuse thrown away. The infusion is boiled for six hours and strained. The skin to be dyed is plunged into the solution and turned round continually for two hours in order to secure uniform adherence of the colour to the skin. It is then immersed in an infusion of *babul* bark and kept in it for four days during which it is occasionally stirred. It is then taken out, squeezed and again steeped in a fresh infusion of *babul* bark for four days, being stirred occasionally as before. Now it is taken out, squeezed and *khari* salt rubbed on that side of the skin which bears the fatty tissue and it is then dried in the sun. It costs Rs. 8 to dye 20 skins and they fetch about Rs. 10 in the market.

*Sabar*.—A kind of leather commonly called "*sabar*" is prepared from deer skin, chiefly in the district of Gorakhpur.

The process of manufacture is as follows :—The skin is spread out in the sun to dry. It is then moistened with water and kept in lime water till the hair falls off. The lime used for one skin is usually 2 lb. which is thrown in about 4 gallons of water. It is then rubbed with the hands to remove the hair from the skin.

The skin is then steeped in a *nānd* full of water to which 1 lb. of fruits of *aonla* (*Phyllanthus emblica*) is added previously.

It is then taken out, sewn into a bag and dried in the sun. The bag is then stuffed with the bark of *sakhu* (*Shorea robusta*) and moistened with water. This imparts a reddish colour to the skin. When the latter has acquired the requisite shade of colour the bark is taken out, the bag unstitched and the skin rubbed over with *khari* salt mixed with ground rice. The *sabar* is then considered to be ready.

## CHAPTER VII.

### RELIGIOUS LAWS, CUSTOMS, CEREMONIES AND SUPERSTITIONS REGARDING COLOURS.

Among Hindus, as a rule, the use of red and yellow colours is associated with manifestations of joy and happiness. These colours are looked upon as auspicious and even sacred. No Hindu "*puja*" or ceremony can be performed without the use in some way of either of them. A kind of red powder called "*roli*" or "*rori*" is commonly used in most of the Hindu religious services. It is often offered to the gods with other offerings. On the occasion of a marriage or childbirth marks or "*tikas*" are made with the powder on the forehead of all the assembly present.

*Kalawa* (cotton thread dyed red and yellow) is similarly used on all happy occasions. Before performing a "*puja*" or making offerings to the gods a Hindu is required to have a *kalawa* tied round his wrist and a red mark made on the forehead with "*roli*" or "*rori*" by the priest. During the marriage ceremony both the bride and the bridegroom put on red clothes. Their palms are generally dyed red with *mehndi* (henna). The wooden post of the *mandhwa* or *mandha*, the temporary shed erected on the occasion of marriage, generally in the centre of the yard of the house

under which all marriage ceremonies are performed, is dyed red with *geru* (red ochre). Among certain classes of Hindu society the custom is to sprinkle a solution of "*gulal*" or a decoction of *tesu* (flowers of *Butea frondosa*) on the friends of the bridegroom at the end of the marriage. Invitation cards for marriages are printed on red paper, a solution of "*roli*" being also sprinkled on the paper. A yellow paste is made by grinding some rice and turmeric with water and is called "*aipan*". Hindu females make marks with the paste on the back of the hands and on the forehead on festive occasions.

*Sendur* (red lead) is largely used by married Hindu females to paint the line on the top of the head where the hair is parted, and its use is always indicative of married and consequently prosperous life of the women. They also make a mark with *sendur* in the middle of the forehead. Widows and maidens are not allowed to use the powder in this manner. In more civilized and educated classes the place of *sendur* is taken by *shanjurf* or *ingur* (vermilion or cinnabar). *Sendur* also plays an important part in religious ceremonies of the Hindus. It is offered to the deity *Bharron* and to the goddess *Kali*. The statue of *Hanuman*, the Commander-in-Chief of Rama's forces when the latter invaded Lanka (Ceylon), is always smeared with *sendur*. *Gerua* (salmon coloured) dress dyed with red ochre is commonly used by Hindu ascetics, owing apparently to the sanctity attached to the colour.

While the red and yellow are so remarkably favoured by the Hindus, the black colour is regarded by them as extremely unlucky, inauspicious and contemptible. There are positive prohibitions in their religious books regarding the use of the black dye, and especially indigo. So great is a Hindu's abhorrence of indigo that the dried stalks of the indigo plant which are sold as fuel are never used by the Hindus of even the lowest class for cooking their food, as the food cooked thereby becomes impure. In *Shlokas* 87 and 89, Chapter X of the *Institute of Manu*, we find the following prohibition :—

"He, i. e., a Bráhmaṇ must avoid (selling) all dyed cloth.....(and) indigo (and) lac." *Shloka* 92 of the same chapter forbids the selling of lac for a Bráhmaṇ in the following terms:—"By (selling).....lac a Bráhmaṇ at once becomes an outcast." In the *Apastamba Smṛiti Adhyāy VI* we find the following:—

"I. Now the sins of using blue dyed clothes by males and females either for wearing apparel, or for sleeping garments are described below :—

"II. Whoever cultivates indigo, sells it or makes profit from it becomes an outcast and becomes purified after keeping three "*kṛichāyan*" *bruts* (a kind of fast).

"III. Ablutions, alms or charity prayers, study, *śradhas* and *pañch mahayaga* are all fruitless to him who wears blue dyed apparel.

"IV. That Bráhmaṇ who wears a blue and red coloured dress and becomes thereby outcast must keep fast for one day and night, and drink *pañchgabya*. (a mixture of milk, curd, cow-dung, cow-urine and water from the Ganges).

"V. Whoever bathes in or drinks the water of a well, lying close to a pit where indigo is made, becomes an outcast and to purify himself must keep three *kṛichāyan* fasts.

"VI. Whoever cuts an indigo plant or even touches it becomes impure and to purify himself must keep a *chandrāyan* fast.

"VII. A Bráhmaṇ who goes intoxicated into an indigo field must keep a fast and drink *pañchgabya*.

"VIII. No twice-born men may eat while wearing blue and red dyed clothes, and, if they do so, must keep a *chandrāyan* fast.

"IX. A Bráhmaṇ who eats anything containing indigo becomes purified after keeping a *chandrāyan* fast.

"X. The piece of land upon which indigo is once grown becomes impure for twelve years (i. e., nothing grown upon it for twelve years should be eaten)."

On the occasion of the *Holi* festival a custom prevails among Hindus of sprinkling yellow coloured water on each other, and of smearing themselves with a red powder called "*gulal*." There are many legends about the origin of this custom, but the following is the most commonly accepted of all:—

There once lived an atheist Rāja, by name Hirannya Kashyap, who had a son, Prahlād. The boy one day chanced to pass by a kiln and saw that some kittens, who had fallen into the kiln, escaped miraculously unscathed.

Astonished at the sight he enquired to what their escape had been due, and was told that the kittens were ever uttering the name of God, "Ram, Ram," and that to this they owed their lives. Much impressed at what he heard, Prahlād began to repeat "Ram, Ram," until it became quite a habit. This roused the ire of his atheist father, who devised many plans of killing his son. The Rāja had a sister, Holka, who possessed a mystic robe that could not be burnt. Wearing this robe she could stand in any fire unharmed. It was proposed that she should take the boy Prahlād into a fire and there leave him to be burned, but as it chanced the mystic robe was snatched from her by some supernatural agency and she was burnt to death, whereas Prahlād escaped unscathed. On hearing the news the friends of Holka threw dust upon each other in expression of their sorrow, while devout men who rejoiced at the delivery of Prahlād sprinkled yellow water upon each other to mark their joy.

One of the theories about the use of the red colours on the *Holi* occasion is that the red is understood to represent menstrual blood—a sign of fertility, the association of fertility being ultimately connected with the *Holi* or harvest festival.

Mr. Crooke explains that the dancing, singing, waving of flags, screaming and throwing of red powder are based on certain ceremonies to scare away evil spirits. Some Pandits explain that the use of the dye solution originated in the time of Vikramāditya and is continued to commemorate his accession to the throne. A similar practice of sprinkling coloured water on each other obtains in Italy, Southern Europe and South and Central America at the time of the Carnival.

The *Shara* (religious law) of Muhammadans has clearly laid down certain rules with regard to the use of colours and dyed fabrics, and they are briefly noted below:—

*The Hanafi Law with reference to colours.*—With the exception of fabrics dyed with safflower and saffron, there is no prohibition for males among the Sunnis of the *Hanafi* class as to their wearing an apparel of any particular colour, provided it is clean in every other respect, e. g., if a coloured cloth is stained with wine, urine, animal excreta, or contaminated in any other way by an impure substance, irrespective of colour, the use of it is forbidden; and any prayers offered with such impure garments are not acceptable to God.

Fabrics dyed with safflower and saffron are however not prohibited for females.

According to the *Shira*, the use of white, green and black colours is generally desirable and of blue colours permissible, but red and yellow colours are "*makruh*" (abominable). The following passage from the *Dur-ul-Mukhtar* prohibits the use of safflower and saffron for males:—

دُكْرَهُ لَبَسُ الْمَعْصُفِرِ وَالْبَزِّ عَفْرِ الْأَجْمَرِ وَالْأَصْفَرِ لِلرِّجَالِ إِنَّهُ لَا يَكْرَهُ لِلنِّسَاءِ \*

"It is abominable for males to use garments dyed red and yellow with safflower and saffron, but it is not so by implication for women." The following passage from the *Rud-ul-Mukhtar* prohibits the use of pure silk garments for males:—

يَكْرَهُ لَبَسُ الْكَرْبَرِ وَكَوْبَحَائِلٍ عَلَى الْمَدْهَبِ الصَّحِيحِ أَوْ فِي الْكَرْبِ عَلَى الرِّجَالِ

لَا الْمَرَأَةَ إِلَّا قَدَرُ أَرْبَعِ أَصَابِعَ مَضْبُومَةً وَيَحِلُّ تَوَسُّدُهُ وَافْتِرَاشُهُ \*

"It is prohibited to use pure silk clothes, but a hemming with pure silk, to the width of four fingers, is authorized. Pure silk may be used for cushions, pillows and floorings." This rule does not apply to women.

*Shia law with reference to colours.*—The Shias cannot say their prayers on a "ja-namaz" or prayer carpet dyed in a fleeting color. This prohibition however does not exist in the *Hanafi* law.

According to the Shia School of law white is the most desirable and decent colour for the use of males. Yellow, green, pink, blue and grey are permissible. The use of deep red is undesirable especially when saying prayers. The undesirability of black colour, save for turbans, cloaks and socks, verges on prohibition.

The fifth and sixth "*Imams*" have allowed the use of deep red colour for bridegrooms. The Prophet once declared that on the Day of Judgment he would have two sorts of garments, the one coloured green and the other red, and that the dress of his successor, Ali, would also be of the same colours on that occasion.

Black coats and shoes are absolutely forbidden and the use of white and yellow shoes specially recommended (*vide Hulyatul muttaqin* by Mulla Muhammad Bakar Majlisi).

On the 10th day of Muharram, Hazrat Imam Husain put on a black cloak and a pink turban, while going to fight the holy battle at Karbala, as is clear from the following passage of the *Biharul Anwar* :—

وَعَلَيْهِ جَبَّةٌ دَكْنَةٌ وَالْعِمَامَةُ مُوَرَّدَةٌ

Among Shias, widows are prohibited during the period of *iddat* (mourning) from using colours calculated to set off their beauty to the best advantage. This is clear from the following passage :—

وَيَلْزِمُ الْمَتَوَفَّى عَنْهَا الْكَدَادُ وَهُوَ تَرْكُ مَا فِيهِ زِينَةٌ مِنَ الثِّيَابِ وَالْأَدَهَانِ الْمَقْصُودُ بِهَا الزَّيْنَةُ وَالتَّطْيِيبُ وَالْإِبَاسُ بِالثَّوْبِ الْأَسْوَدِ وَالْأَدْنَى لِبُعْدِهِ عَنْ شِبْهِ الزَّيْنَةِ \*

According to the *Hanafi* law a widow is prohibited from wearing fabrics dyed with safflower, saffron and red ochre (رُس) during the period of mourning. She is bound to wear white dress.

Both Shias and Sunnis are prohibited from saying their prayers on cloth made of pure silk. Women in both sects are not allowed to use *sendur* (red lead) and *mahawar* as a paint, and are prohibited from tattooing themselves with indigo.

The following remarks with regard to the uses in ceremonies of dye stuffs and dyed fabrics among the Muhammadans of this country are of some interest :—

The celebration of marriage among Muhammadans begins with the performance of the ceremony known as *manjha* or *lagan*, when the female relations of the bride, or in some cases of the bridegroom, take to the latter a suit of the clothes which he is made to put on in order to signify that the wedding is shortly to take place.

This dress consists of—

- (a) an *angrakha*, or the coat of special cut in ordinary use ;
- (b) a *kurta*, or shirt ;
- (c) a *topi*, or cap ;
- (d) a *rumāl*, or square sheet resembling a table cloth generally of *chikan* ;
- (e) a *paijāma*, or pair of loose trousers.

The first four are invariably dyed yellow in a decoction of *tén*, or among the poorer classes with turmeric, and the last is almost always made of some kind of red

cloth, generally *sangi* or *gailbadani*. The girdle (*kamarband*), which is made of cotton yarn, is dyed red in the middle and yellow on the corners. A scarlet or pink handkerchief is also sent as a rule.

After the bridegroom has put on the garment the (*kangana*), which is made in the following manner, is tied round the wrist of his right hand :—A little wheat bran, some grains of rice, a few blades of *dab* grass (*Cynodon dactylon*) and a dead fly are put into a piece of yellow cloth made in the form of a little sack, which is again wrapped over with a piece of red cloth. The little sack is tied together with a small bit of turmeric and one of madder (*majith*), a ring of iron and one of silver, to a piece of cotton yarn long enough to serve as a strap for the wrist. A kind of sweetmeat called "*pindi*" made from samolina, sugar and *ghi* and dyed with turmeric or saffron, accompanies the apparel. A mixture (*butna* or *ubtan*) of barley flour and some scents dyed likewise with turmeric is also sent to the bridegroom to be made into a paste and rubbed daily all over the body in order to improve his complexion and the colour of his skin before the wedding comes on. All these things are brought to the bridegroom in a copper basin (*lagan*); hence the name of the ceremony.

On the same day the bride is made to put on a yellow "*dupatta*" and a yellow "*kurti*" (jacket) and to tie a similar *kangana* round her wrist, there being no restriction as to the colour of her "*paijama*." On the wedding day the bridegroom's dress consists of (a) the *nima*, an ancient shirt of special make which is always white, (b) the "*jama*," a long robe, generally of muslin, dyed red, as a rule, in a tincture of safflower to which some scents are added, (c) a turban, which is also invariably of a bright red colour, (d) a veil usually of the same colour, but of much finer material, occasionally interwoven with gold, (e) the *sehra* or garland made of flowers, but sometimes of white cotton wool made to resemble flowers as closely as possible, (f) the *paijama*, which is almost always dyed to some shade of red or made of some fabric of that colour, except among Fatimite Saiyids, who use a green *paijama*, and (g) the shoes, always embroidered and of any colour other than black or green, which are looked upon as inauspicious.

Immediately before the nuptials the bride puts on (a) a red *kurti*, (b) a white "*dupatta*" stitched in the borders with silken thread of various colours, (c) 3 "*duputtas*" of uniformly red colour, one over the other, and (d) a *paijama*, which may be scarlet, pink or magenta, except in case of Saiyids, among whom it is the custom to use a green *paijama*. The bride's shoes must never be green or black or else the marriage will be unhappy.

The custom of throwing dye solutions upon one another on the occasion of marriage or childbirth is not uncommon among Muhammadan ladies, standing in such relation among themselves, as would permit them under the rules of the society to indulge in such amusement, e. g., A's sister will be quite welcome to take such a liberty with A's wife or even A's wife with A's sister's husband and *vice versa*.

According to custom a Muhammadan woman must leave off wearing clothes of any shade of red as soon as her husband is dead and must break her "*churi*'s (glass bangles) of whatever colour they may be. On the 3rd day after the death she is made to put on a white dress specially prepared for her by her relatives, which is called *randsala*, and she must never use any red apparel thereafter. Women who are particularly scrupulous in this matter abstain from using, even for their *paijamas*, printed fabrics in which the greater portion of the pattern is tinged with a shade of red, even though the ground be perfectly white.

In the month of Muharram it is customary with the Shia Muhammadans to wear either green or black clothes as a sign of mourning. The former are worn exclusively by the Saiyids, and the latter chiefly by non-Saiyids. An endless piece of cotton yarn dyed with safflower and called *nara* is also worn round the neck in imitation.

of the iron chains into which Sajjad, the son of Husain, was put by the victorious general of Yezid's army after the battle of *Karbala*.

Men generally take off the mourner's dress on the 12th of Muharram, but most of the females keep it on till the 20th of the following month (*safar*) when the mourning period is completely over. On that day they dip a corner of their *dupatta* in a red dye to denote that they can thenceforward use red clothes until the next Muharram. The use of *pán* leaves, which gives a red hue to the lips and tongue, and of *mehndi*, (henna), which imparts a red colour to the palm and the sole, is completely dispensed with during the Muharram. Rigid Shia females do not take off the mourning dress until the morning of the 9th of *Rabi-ul-awwal*.

\* In Lucknow and other places where the population of Shias is considerable red and yellow colours are profusely thrown upon each other among themselves as a mark of mutual rejoicing on the occasion of "*Nauroz*," when, according to their belief, the Prophet conferred the caliphate on his son-in-law, Ali, at Khumm-i-Ghadir. "*Nauroz*" is observed on the day on which, according to the Muhammadan astronomy, the sun goes into the *burj-i-hamal* (Aries or the Ram), which usually happens about the middle of March. The Sunnis, who do not admit that the honour was bestowed on Ali, take no share in these festivities.

With regard to the origin of "*Nauroz*" Mulla Muhammad Bakar describes the following story in the "*Zad ul maad*":—

A certain form of plague once caused such a terrible loss of life in a certain place that people ran away from their homes in thousands to take refuge in another locality. In doing so they incurred God's utmost displeasure, and He therefore killed them all at once. Their bodies decayed, but skeletons remained on the spot. Hizqil, one of the apostles of God, happened to come across the remains. He earnestly prayed that God might be pleased to resuscitate the dead, and thus to show him His Supreme power. Thereupon God sent him word through an angel enjoining the apostle to sprinkle water on the remains. The apostle carried out the commands and the dead all became alive. This happened on "*Nauroz*," the 1st day of the Persian year. Since then it has become a rule (*sunnat*) to sprinkle water on each other on the New Year's day to commemorate the happy event. An allusion to the above story will be found in the passage of the *Qorán*.

أَلَمْ تَرَ إِلَى الَّذِينَ خَرَجُوا مِنْ دِيَارِهِمْ وَهُمْ أَلُوفٌ حَذَرَ الْمَوْتِ فَقَالَ لَهُمُ اللَّهُ مُوتُوا  
ثُمَّ أَحْيَاهُمْ \*

In associating with this ancient custom the gaieties of the anniversary of Ali's installation to the caliphate, the Muhammadans of Persia introduced the sprinkling of rose-water in place of plain water. The present practice of using colours instead of rose water has apparently grown up among the Shias of this country in imitation of the Hindus, who do the same in their *Holi* festival.

## CHAPTER VIII.

## MISCELLANEOUS BRANCHES OF DYEING.

**Section 1. Paper Dyeing.**—Formerly paper used to be dyed with native dyes, such as safflower, turmeric, &c., but since the introduction of foreign dyes it is generally dyed with the latter, and sometimes with mixtures of the two kinds of dyes.

Coloured paper is used in these Provinces for making kites, "*aravish*," "*tāziās*," and "*kandils*."

At Kālpi, a town in Jalānā, the paper for kite making and other purposes is chiefly dyed with the safflower dye, the process being as follows:—

The sheets of paper are first dipped in water to which some mango acid has been previously added.

They are then dried and dipped several times in red safflower tincture and lastly in acidulated water. This being done, they are dried, placed over wooden planks and then rubbed and polished with a glass rubber (*mohra*).

There is a small but fast decaying paper making trade in the district of Farukhabad at Kanauj where the manufacture is carried on as follows:—

Hemp (*san*) is put in a large deep reservoir and pounded for several weeks on a piece of stone by a very heavy hammer shod with iron at the end of a wooden beam worked as a lever by the weight of two men.

To make 240 sheets of 25 *dastās* (quires) of the paper used for Baniya's books, 12 lb. of the pounded hemp, 2 lb. of *sajji* and 2½ lb. of lime are put in a small tank, 6' × 4' × 3' deep filled with water. The hemp is quite disintegrated and on the mixture being stirred up is held in suspension. A very fine mat on a wooden gridiron 26" × 20" is then put in the tank, and is so weighted as to be just below the surface. It is moved so that a thin layer of the mixture is deposited and remains on the mat when the frame is raised.

In a few minutes it is dry enough to be removed, when it is hung on the wall to dry thoroughly.

These operations are repeated and sheets of paper are thus prepared successively.

As a rule plain paper is made, but occasionally it is dyed as follows, the colour being added in the tank:—

Buff (*badami*)—

<i>Multani matti</i> 8 oz., cost	...	...	...	Rs. a. p.
Milk is also added as an intensifier.				... 0 0 3

Yellow (*zard*)—

<i>Haldi</i> (turmeric) 8 oz., cost	...	...	...	... 0 4 6
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Red (*sarkh*)—

Aniline dye. *Al* is never used owing to the expense.

Blue (*nilā*)—

Indigo 2 drams, cost	...	...	...	... 0 0 6
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Pale green (*zangari*)—

Copper sulphate ( <i>tutya</i> ) 2 drams, cost	...	...	...	... 0 0 6
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Green (*sabz*)—

Aniline dye.

After the paper is dry it is glazed with wheat starch (*māri*) applied with a piece of blanket, such as is used for the operation called *putai* in cotton-printing.



The cost of making 240 sheets is about Rs. 2 and that of glazing about annas 2 more.

**Section 2. Dyeing "Badla".**—Silver thread (*badla*) not coated with gold is very largely dyed yellow or orange in Benares in order to give it the appearance of gold thread and is twisted with cotton thread to form what is called *kalabatun*.

Genuine *kalabatun*, which is usually made with silver thread coated with gold, is largely used in the manufacture of the fabric called *kamkhab*. The *kalabatun* made with dyed *badla* is used for making inferior kinds of *kamkhab* and occasionally for adulterating the genuine *kalabatun*. To dye *badla* it is first smoked with crushed dung cakes moistened with water in order that the combustion may take place very slowly. The smoke gives it a pale yellow colour. When the *badla* has assumed this colour it is spread out in a pan, and turmeric, previously powdered, is gradually sprinkled over it, the *badla* being stirred so that the turmeric may adhere uniformly to it. This being done the *badla* is transferred to a small earthen pot having a lid which is placed over a fire. The contents are stirred for a little while and the mouth of the pot is then closed. The lid is opened every now and then, to see that the thread is not overheated. This process is technically called "*usinna*," and is carried on till the pot gets slightly hot. The lid is then removed and the contents of the pot are returned to the pan and kept there to cool down.

The colour produced is a beautiful golden yellow. To dye orange the preparation, called *rori*, is used in place of turmeric, other processes remaining unchanged.

**Section 4. Dyeing "Parni" (tin leaf).**—Tin leaf is dyed generally in 3 colours, pink, green and orange-yellow, all of which are, as a rule, obtained from European dye powders. The method of dyeing is as follows:—

Half a dram of the required dye powder is thoroughly mixed with 2 oz. of melting lac obtained from the *pipal* tree. When cool the mixture is powdered and put in a piece of cloth which is tied so as to form what is called a *potli*.

The *panni* to be dyed is placed over an earthen plate made hot by putting it over a fire and the *potli* containing the dye is gently moved about on the surface of the leaf, imparting a colour to it.

**Section 4. Dyeing Hemp and "Moonj Ban".**—Strings (*bán*) made of *munj* grass (*Saccharum mungo*) and fibre of hemp (*Crotalaria juncea* and *Hibiscus cannabinus*), which are used for making mats and floor coverings and for knitting *charpais* (bedsteads), are occasionally dyed. The material is simply washed and kept loose so that it may absorb the dye liquid uniformly.

The following methods of dyeing reported from the District Jail of Lucknow are commonly followed by the natives:—

(1) To dye *kala*, or black blue, the material is boiled in water with catechu and myrobalan and dried.

(2) *Nila*—(dark blue).—To produce this shade a solution is prepared from Chinese blue and alum is added to it. The hemp or *munj bán* is then boiled in it and dried.

(3) *Surkh*—(scarlet).—To obtain this shade the hemp or *moonj bán* is boiled in a solution of magenta for half an hour, taken out and dried in the sun.

(4) *Katthai*—(catechu brown).—The hemp or *moonj bán* is immersed so as to remain a few inches below the surface in a solution prepared by mixing 2 lb. of catechu and  $\frac{1}{2}$  lb. of lime with 40 gallons of water (cold). The material is allowed to steep for a whole night, taken out in the morning and dried in the sun. If a deeper colour is required the process is repeated three or four times.

(5) *Zamirradi* (dark green) is obtained by boiling the *bán* in a solution of the European aniline dye of that colour with some alum.

**Section 5. Dyeing Candles.**—Sometimes candles are coloured with native dyes, but the work is regarded as of an ornamental rather than an industrial character. The method of manufacturing candles which have to be coloured is of a primitive nature.

A circular frame work is first hung up. Wicks of uniform length made of cotton thread are then moistened with fat liquified on a fire, and when cool they are rolled with the palm of the hand on the flat and even surface of a stone or other material till they are perfectly straight and stiff. The wicks are then suspended around the circular frame and liquid fat clarified with alum is, while hot, poured over the wicks with an iron *karchha*, the frame being moved round in order to pour the liquid on one wick after another. With repetition of this process successive layers of fat are deposited on the wicks till sufficiently thick candles are formed.

To dye red, sendur is rubbed in a vessel and thrown into the fat boiling in the pans. To produce the colour on the candle, fat coloured in the above manner is used for the last three or four layers.

Blue colour is produced by treating the fat with indigo in a similar way. Dyed candles are used chiefly in the *Muharram* and in marriage ceremonies.

**Section 6. Printing Tat.**—*Tát* is a well known coarse material manufactured with strings made of the fibre of *Sanai* (*Grotolaria juncea*) and used for making floor coverings, bags, &c.

It is sometimes printed with coloured patterns like calicos are printed by *chhipis*. The process of printing as carried on in Cawnpore may be briefly described as follows:—

The outlines of patterns are first printed on the *tát* with the iron liquor known as *lakkar*, described under calico-printing on page 50.

The empty spaces within the outlines are then printed over with wooden blocks (*datta*), whose hollows have been previously filled with ginned cotton, the various dyes being applied to the blocks in the same way as for calico-printing. On this principle patterns in any required colour may be produced on the *tát*.

The dyes commonly used in *tát* printing are—

(1) For *kattai*—(catechu brown).—Four pounds of catechu is boiled with sufficient quantity of water; 2 oz. of lime is then added and the decoction thoroughly stirred with the hand till it assumes a reddish-brown colour. One pound of *dharu* gum is then added to thicken the mixture.

(2) For grey (*kháki*) one pound of myrobalan is boiled and rubbed thoroughly with the hand and strained. The decoction is then mixed with  $\frac{1}{2}$  gallon of cold water. Two ounces of ferrous sulphate and 2 oz. of *dharu* gum are added to it.

(3) For green, the green aniline dye is mixed with enough water to make a liquid of the required consistency to be applied to the printing block.

(4) For red, four pounds of *sajji* is mixed with  $\frac{1}{2}$  gallon of water which is placed on a fire. When it begins to boil 2 oz. of red European dye is thrown in and the boiling continued till the liquid becomes somewhat thick.

**Section 7. Hair Dyeing (*Khizab* or *Vasma*).**—The following are a few of the methods ordinarily employed by the natives for dyeing the hair:—

(1.) <i>Lohkun</i> (an oxide of iron)	...	...	...	...	$\frac{1}{2}$ oz.
<i>Nausadar</i> (sal ammoniac)	...	...	...	...	$\frac{1}{2}$ oz.
Salt (sodium chloride)	...	...	...	...	6 grains.
Wheat flour ...	...	...	...	...	$\frac{1}{2}$ oz.

are mixed with two ounces of water put over a fire and stirred till the mixture becomes a thick paste. When cool it is applied to the hair. After which castor leaves are put over the applied paste and tied up with a cloth. This process is called *dhātā bāndhnā*. After an hour the paste is washed off with an infusion of fruit of *aonla* (*Emblia officinalis*).

(2) <i>Majuphal</i> .—(gall nuts) [ <i>Quercus infectoria</i> ]	...	...	4
<i>Sang rasikh</i>	...	...	1½ drams,
<i>Tutia</i> (copper sulphate)	...	...	8 grains.
<i>Nausddar</i> (salammoniac)	...	...	10 grains.

are ground fine in a *harvan dusta* and mixed with an infusion of myrobalan (*sangi har*). The paste is applied to the hair and tied up with castor leaves as in the case of receipt No. (1) for one hour. The hair is then washed with clear water.

(3) Henna leaves are ground with water. The paste is applied to the hair and washed off after half an hour. In the same way indigo leaves are applied for one hour and the hair washed with clear water.

This *khizab* is generally applied once in a fortnight or three weeks. Mr. Emile reports from Fatchpur that in the meanwhile some people apply the following solution once a week :—

Half an ounce of *lohchun* and an equal quantity of ground *am ki bijli* (the inner portion of a mango seed) are put into a quart bottle, which is buried in the ground under a *babul* tree (*Acacia arabica*), one of the underground stems branching off from the root being incised with a knife and inserted into the bottle like a cork. This bottle lies buried in the ground for three weeks, with the result that in the rains the bottle becomes filled with the *babul* sap. The bottle is then dug out and the contents used as a hair dye.

(4) The following recipe prescribed by Hakim Nawab Shifa-ud-daulah of Fyzabad makes an excellent hair dye :—

<i>Majuphal</i> ( <i>quercus infectoria</i> )	...	...	...	...	5 oz.
Cloves	...	...	...	...	½ oz.
Copper sulphate	...	...	...	...	½ oz.
<i>Myrobalan</i> ( <i>har siah</i> )	...	...	...	...	5 oz.
Common salt	...	...	...	...	½ oz.
<i>Sang-i-Rasikhmisi</i>	...	...	...	...	1½ oz.

The first three ingredients are parched with hot sand and pounded with the remaining ingredients into a fine powder. The bath is kept in a well-corked bottle. When required a sufficient quantity of the powder is mixed with water to make a paste, which is applied to the hair and when dry washed off.

## CHAPTER IX.

### USE OF DYES IN CULINARY PREPARATIONS, ETC.

Native confectioners (*halwais*), manufacturers of jams and preserves (*trakābdars*) and cooks (*bāwarchis*) practise certain methods for imparting colours, with native dye stuffs, to the various articles they make for table use. The colours ordinarily produced are :—

- (1) *Yellow*.—Obtained from turmeric and saffron and occasionally from *harsingkar* flowers.
- (2) *Red*.—Obtained from *Gujrati sendur*, *mehawar*, cochineal and the fruit of the red variety of tamarind.
- (3) *Green*.—Obtained from the sap contained in the leaves of *pīlak* (*Beta vulgaris*), *sem* (*Dolichos lablab*), *bathua* (*Chenopodium album*), *muli* (*Raphanus Sativas*), *bhāng* (*Cannabis sativa*) and pistachio nuts.

- (4) *Shades of purple and magenta*.—Obtained from the juice of the fruits of *falsā* (*Grewia asiatica*), pomegranate rind, *mehawar* and indigo.

#### A.—SWEETMEATS.

The sweetmeats commonly coloured are :—

- (a) *Barfi*.—Prepared by adding *khoyā* (milk boiled down to a thick consistency) to boiling syrup and allowing the mixture to cool and solidify, when the mass is cut into oblong or square pieces called *barfi*.

To produce red colour, *Gujrati sendur* is thrown into the syrup before adding the *khoyā*, one dram of the dye being enough for 2 lb. of the syrup.

For yellow,  $1\frac{1}{2}$  drams of powdered turmeric or a dram of saffron well ground with water is used in a similar manner. To obtain a green colour, indigo is rubbed in a vessel and mixed with the turmeric, but the practice is confined to Muhammadan confectioners, the Hindus having strong religious objections to eating indigo in any form. The Hindu confectioners pound the leaves of *pālak* (*Beta vulgaris*), *sem* (*Dolichoslablab*) or *bathuā* (*Chenopodium album*) on a slab and extract the juice in a vessel by squeezing the mass with their hands. The vessel is kept on a fire until a green sediment called *lubdi* settles down at the bottom. The surface liquid is decanted off and the *lubdi* mixed with the *khoyā* or the syrup.

Violet is obtained by mixing one dram of *Gujrati sendur* with  $\frac{1}{2}$  dram of indigo previously rubbed into a fine paste. This method again is followed only by Muhammadan confectioners.

In making *barfi* the quantity of *khoyā* used is sometimes equal to that of the sugar, but generally varies from  $\frac{1}{3}$  to  $\frac{1}{2}$  of the sugar. The less the proportion of sugar the better is the quality of the *barfi* supposed to be. *Barfi* sells at 3 to 6 lb. per rupee.

- (b) *Lauz-i-Pistā*.—This is prepared in the same way as *barfi*, only ground pistachio nuts are used instead of the *khoyā*. The colour is of course naturally green. Price  $1\frac{1}{2}$  to 2 lb. per rupee.

- (c) *Laddu*.—This preparation is of two descriptions :—

- (1) *Moti chur kā laddā*.—To prepare this gram flour is mixed with water and the mass beaten well. A frying pan containing *ghī* is then placed on a fire and the liquid mass is rubbed over the surface of a perforated implement called *chhanna*, so as to drop in small bits (*bundias*) about  $\frac{1}{8}$  to  $\frac{1}{2}$  of an inch long into the pan.

When fried, the *bundias* are soaked in syrup and made into balls. In this preparation the dye is always added to the gram flour in the course of beating, and is usually *sendur* or cochineal, or a mixture of turmeric and indigo. Occasionally some of the *bundias* are dyed red, and others blue or green and the variously coloured *bundias* mixed together afterwards to make the *laddu*. Price 4 lb. per rupee.

- (2) *Mung kā laddā*.—Kibbled *mung* (*Phaseolus mungo*) is first steeped in water and the husk removed. The *dāl* is then ground on a slab, fried in *ghī* and mixed with syrup to make the balls (*laddus*). In this instance ground turmeric or saffron is first thrown into the *ghī* and boiled till the *ghī* assumes a yellow colour. The ground *dāl* is then fried in it and takes up the dye. The colour is a beautiful yellow. Price 4 lb. the rupee.

- (d) *Imarti*.—This is a cake of a peculiar shape prepared by frying in *ghī* a liquid paste (*pithi*) made by grinding *dāl* of *mung* (*Phaseolus mungo*) or *māsh* (*Phaseolus radiatus*) and then saturating the cake with syrup. A red or green dye is usually mixed with the (*pithi*). Price 4 lb. the rupee.

(e) *Bālu Shāhi*.—Wheat flour is kneaded with *ghi*, milk and water, and cakes made from it are fried in *ghi* and then soaked in syrup. The juice of *falsā* fruit is mixed with the sugar before preparing the syrup, to which it imparts a shade of violet. Price 4 lb. the rupee.

(f) *Nuql* or *Ilāchi Dānā*.—Cardamom seeds and parched gram coated with thick syrup are known by these names. The colouring matter is added to the sugar before it is boiled down to the required consistency. *Nuql* is largely consumed in Lucknow on occasions of marriage among the Muhammadans. Price 6 lb. the rupee.

Such European dyes as are not poisonous are now commonly used instead of native dyes by the confectioners, chiefly in Benares, Basti, Allahabad, Rae Bareilly, Sitapur and Sahāranpur.

Mr. Emile reports that in Fatehpur a *halwai* prepares sweetmeats, which are imitations of fruits, made entirely of sugar. The manufacture consists in pouring thick boiling syrup into hollow earthen moulds of the shape of the various fruits and made in pieces which are joined together and tied with a string. The sugar solidifies on cooling and assumes the shape of the fruit, which is removed by opening out the pieces of the mould.

To produce the various colours on the imitated fruits, sap of *sem* leaves and solutions of turmeric, saffron and *sendur* are applied on them, the exactness of the imitation of colours depending upon the skill and precision with which the application is made in each case.

#### B.—JAMS AND PRESERVES.

(a) *Pethe ki Mithāi*—(preserved white gourd).—The gourd is cut into small pieces, which are boiled till soft and dried in the shade. They are then thrown into boiling syrup sufficiently thick to solidify on cooling. The dye is added in the shape of powder to the syrup as soon as it is brought down from the fire. The substances used are *sendur*, saffron and indigo. Price 3 to 4 lb. per rupee.

(b) *Ām kā Murabba*—(preserved mango).—Saiyid Jauwad, an expert of Fyzabad, produces three or four colours on each slice of mango in the following manner, giving it a most picturesque appearance:—

- (1) Red colour is extracted from *mahawar*, which is rubbed with the fingers in a vessel containing water. The liquid is allowed to stand until a sediment settles down. The clear solution is then decanted off and kept in a shallow vessel for one or two days. It reduces in bulk on account of evaporation.
- (2) Turmeric is peeled with a knife and the pith is rubbed on a slab into a fine paste which is dissolved in a little water.
- (3) Indigo is similarly rubbed and kept in a vessel.
- (4) A purple dye is prepared by mixing some indigo paste with a little of the tincture of *mahawar*.
- (5) A green dye is made up by mixing indigo and turmeric pastes together in water.

A large slice of raw mango (generally of the Maldā variety) is then taken, and the various tinctures are applied on different parts of its surface with a fine camel hair brush. When the colouring matters are fully absorbed by the mango the surface of the slice is carefully and gently rubbed over with a piece of wet sponge, in order to wipe off the superfluous quantity of each colour, and to fix the colours uniformly and evenly on the various portions of the slice. The slices are then punctured with a fork made of needles, dipped in boiling water and then repeatedly in ice-cold water.

When perfectly cold the slices are gently pressed between layers of folded cloth to get rid of the moisture, and thrown into a vessel containing hot syrup. Next morning they are transferred to another vessel containing thicker syrup, and on the next day they are put in a syrup thicker still. Finally they are boiled with fresh syrup to which some rose water, *keord* and lime juice are added. Various coloured slices are in this way preserved in the same bottle. Price 1½ lb. the rupee.

Syrups for preserves are also coloured on these principles in any shade required.

The rind of fresh pomegranate imported from Kandahar and commonly called *Kandhari anár*, when boiled with water, yields a decoction of a beautiful red colour. Sugar is boiled with the decoction and the coloured syrup thus obtained is largely used in many districts for preserving fruits and making "*sharbats*."

The red tamarind which grows largely in the neighbourhood of Fyzabad city is used as a culinary dye, as well as for making a preserve or jam of its own. If ripe the pulp is infused with water and yields a red infusion. In the raw state it has to be boiled. Sugar is mixed with the decoction or infusion, as the case may be, to produce a coloured syrup.

### C.—DISHES.

The dishes commonly coloured by the native cooks are :—

- (1) *Zardá*, or rice cooked with sugar or syrup, cloves, cardamoms, sultanas and *ghi*. The rice is usually boiled first with turmeric which imparts a yellow colour to it. The superfluous water is then strained off. Sugar is then added to the rice, which is put back into the saucepan with other ingredients and cooked.

- (2) *Muzafar*.—Same as *zardá*, only saffron is used instead of turmeric.

- (3) *Pulao*, or rice cooked with meat, *ghi*, spices and salt. In this case the rice is generally coloured with saffron.

Sometimes, however, it is the practice to take out a portion of the rice from the pan before it is fully cooked and dye it in a decoction of *har-singhar* flowers. The coloured rice is then mixed with the plain rice in the pan and stirred. *Harsinghar* flowers give a somewhat disagreeable taste and flavour, though a fascinating colour to the rice. Hence the practice of colouring only a small quantity of the rice in each pan.

- (4) *Mutanjan*.—Same as *pulao*, only with addition of sugar from 1½ to twice the weight of rice used. Saffron is the stuff employed for colouring the rice for *mutanjan*.

## CHAPTER X.

### CERTAIN DYE PREPARATIONS USED FOR SPECIAL PURPOSES.

*Rori* or *Roli*.—*Rori* is a preparation of turmeric manufactured chiefly in Benares and used for—

- (a) dyeing silver thread called *badla*, and (b) by Bráhmans and other high classes of Hindus for making caste-marks on the forehead.

The process of manufacture is as follows:—

Ninety pounds of turmeric is taken and well washed. It is then thrown into an iron pan with sufficient quantity of water and the following substances:—

Borax	...	...	...	...	...	15 lb.
Alum	...	...	...	...	...	15 lb.
Lime	...	...	...	...	...	5 lb.
Sal ammoniac	...	...	...	...	...	2½ lb.

The pan is then placed over a fire. When the whole quantity of water is evaporated, the turmeric is taken out of the pan and spread over a *tāt* daily for four or five days to dry in the sun. When fully dried it is powdered in a mortar (*okhli*) with a *babul musal*, having no iron ring at the lower end.

The powder is then passed through a leather sieve and spread in the sun. It is again ground in a handmill to make it fine, and is afterwards passed through a sieve made of a very fine cloth called *buk*. The powder is now ready for the purpose of dyeing *bādla* and is known in market as *rori*.

Another method of preparing *rori* is as follows:—

Eight ounces of turmeric is taken, washed and steeped in a sufficient quantity of lemon juice. It is afterwards sprinkled over with  $6\frac{1}{2}$  drams of borax and  $1\frac{1}{2}$  drams of alum, dried in the sun and powdered. About 7 drops of linseed oil are added to the powder, which is then ready for use.

*Mahawar* is a preparation having for its object the preservation of the colouring matter of lac and certain other dyes in cotton wool, from which it is extracted again, and is used by Hindu women for painting their hands and feet. The method of its manufacture is as follows:—

Lac is powdered and mixed with *sajji* and water or a solution of "*reh*," and well rubbed till the solution assumes a beautiful pink colour, and then strained through a cloth.

The tincture is then put into an earthen pot and boiled over a slow fire, adding some powdered bark of *lodh* (*Symplocos racemosa*), till  $\frac{3}{4}$ th of the water is evaporated. In some districts *manjith*, alum and some acid are also added along with the *lodh* bark.

Cotton is then dipped into the decoction and allowed to dry. It is dipped a second time, dried and made into little balls. At the time of using it the ball is soaked in water till it gives forth its dye, and with a thin stick the colour is applied to the hands and feet.

*Gulāl*.—*Gulāl* is a red powder used by the Hindus at the time of *Holi* for sprinkling upon each other, and is made in three different ways, viz. :—

- (1) The European red dye powder is mixed with flour of *singhara* (*Trapa bispinosa*) and a little water and the mixture dried in the sun.
- (2) *Shangarf* (cinnabar) is mixed with the flour of *singhara* (*Trapa bispinosa*) and water and the mixture dried.
- (3) *Singhara* flour is kneaded with a strong decoction of sappan wood and dried.

*Abir*.—*Abir* is another powder used in the same way as *gulāl* and is made by mixing *gulāl* with finely powdered talc.

## CHAPTER XI.

### DYE STUFFS.

#### A. Of vegetable origin.

##### *Nil* (Indigo).

[*Indigofera Tinctoria*.]

Indigo is grown in almost all, except the Himalayan, districts, of the North-Western Provinces, and specially in the districts where canal water is available for irrigation in the hot weather.

Indigo is sown either in March and April, in which case it is called *chaiti* or *jamaa*, or at the time when the rains set in, this being known by the name of *asārhi*.

The *chaiti* system of cultivation is more common in these Provinces. The land is first watered artificially and, when soft, ploughed up. The seed is then sown broadcast at the rate of 16 lb. per acre.

In Aligarh and the neighbouring districts it is however not the practice to plough the land. The seed is simply scattered over the irrigated area and the latter run over with a bush harrow made of *babul* branches to cover the seed over with soil.

The plants are up in a week and the crop is then irrigated. It is watered every fortnight till the rains set in and is weeded when necessary; at least twice during the season. The crop is cut in August and the stumps left for seed till December, by which time the after-math yields a crop of seed.

If it is intended to take a spring crop after the indigo, the stubble is ploughed up in September and October and the field sown with wheat or some other *rabi* crop.

*Asārhi* indigo is ready for cutting a month later than the *chaiti* indigo and is generally left in the ground till the following rains, when it springs up, yielding a second crop known as *khunti*.

The average outturn of plant under the *chaiti* system is about 80 maunds per acre; but that of *asārhi*, though somewhat less than this in the first year, is equal to it in the second year. The number of waterings given to *chaiti* indigo before the rains set in depends upon the dryness of the air, while *asārhi* indigo requires no waterings before or after sowing in a year of average rainfall.

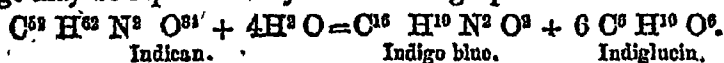
The plant is ready for cutting just before flowering. When cut it is called *lank* and is immediately carried to the factories, where the dye-extracting process commences at once.

The chief parts of a factory are:—

- (1) A water tank called *jal haur* in which the supply of water is kept up from an adjoining well.
- (2) Two sets, of vats one at a higher level (known as *bujhai ka haur*) than the other, called *bilone ka haur*. The upper is used for steeping the plant and the lower for concentrating the dye matter.
- (3) A boiler and furnace for boiling the dye.
- (4) An apparatus for straining and pressing.

The *lank* is packed into the vat which is then filled with water from the tank, the plant being submerged by an arrangement of cross-bars and steeped for about 12 hours. It is of great importance that steeping should cease at the right time, otherwise the dye matter is lost, or the produce deteriorates in quality. When the steeping is finished, a plug is drawn and the water of the upper vat drained off into the lower vat through a channel, leaving the *lank* behind, which is taken out and replaced by a fresh supply of *lank*. The liquid thus obtained is greenish and contains a glucoside known as indican ( $C^{62} H^{63} N^2 O^{81}$ ), which has been extracted from plant leaves by fermentation. In order to convert it into indigotine or blue indigo ( $C^{16} H^{10} N^2 O^2$ ), upon which depends the colouring principle of the indigo, it is necessary to oxidise the indican. For this purpose seven or eight men stand in the vat and agitate the liquid with their hands or iron *karchhas*, the process being called *bilona* or *mahai*. As oxidation proceeds dark blue particles of indigotine, technically called *fecula*, appear in the liquid, which now assumes the blue colour.

During this process another substance known as indigluin ( $C^6 H^{10} O^6$ ), a peculiar kind of sugar, is also formed. The reactions which take place in the manufacture of indigo may be represented by the following equation:—





The process of *mahai* continues for about two to three hours, after which the liquid is allowed to stand till the fecula settle down. This takes about two hours' time and the precipitation is sometimes assisted by pouring cold water into the vat. The surface liquid is then drained out through the holes made in the sides of the vat. The dark blue sediment is now conducted into the boiler, which is kept over a fire for about five hours. The boiled dye matter is then passed through a cloth strainer to separate the dye particles from the water. The thick mass then left is allowed to lie on the strainer until partially dry. It is then carried to the press (*pench*), in which it is subjected to gradually increasing pressure for about 12 hours, when it takes the form of firm slabs, which are cut into cakes called *buttis* or *guttis*.

The method above described is followed for preparing the "*pakka*" indigo for the European market. But for ordinary use in the native dyeing industry the indigo is not boiled, but prepared in what is called the "*kachcha*" form by the following process:—

The *lank* is thrown into a vat (15 feet deep and  $7\frac{1}{2}$  feet in diameter) and allowed to remain in it under water from 12 to 14 hours, but not longer. The stalks are then taken out and thrown away; the liquid is beaten with bamboos or *karchhas* for four or five hours. Half a pound of gum of *dhak* tree (*Butea frondosa*) is then thrown into it and the fecula allowed to settle down. The water is then drained out by opening a hole in the side of the vat, and the thick sediment is taken out and kept on a piece of *garhá* cloth, which is loosely hung up for the night in order to let the superfluous water filter out. Next morning the dye matter thus prepared is placed in lumps on ashes spread in the sun and dried. The cakes thus obtained are called *kachcha nil* or *nilbari*.

[The process of preparing the indigo dye has been treated fully in section (ii) Chapter II (Blue and its shades).]

Price:—

						Rs.	a.	p.	
<i>Kachcha</i> indigo	...	...	...	...	...	2	8	0	per seer*
<i>Pakka</i> indigo	...	...	...	...	...	4	8	0	Ditto.

**Kusum (Safflower).**—This dye stuff consists of the dried florets of a thistle-like plant called *Carthamus tinctorius*. There are two varieties of the plant, *viz.* (1) the prickly, and (2) the soft. The latter is sown chiefly for the sake of its flowers and the former for seed.

Safflower is more or less cultivated in most of the districts in these Provinces and also in other Provinces of India, generally as a subordinate crop and only occasionally by itself. It is grown as a secondary crop together with wheat, barley, gram and carrots. When sown alone the quantity of seed is about 24 lb. per acre. The land should be well manured and ploughed in the month of June or July after setting in of the rains, and the ploughing continued till October when the crop is sown. With wheat it is sown at the rate of 6 lb. per acre, with barley about 8 lb. and with gram about 10 lb. Along with wheat and barley safflower is sown on the borders of the field, and also within the field at long intervals in rows. In case of gram, the gram seed is usually mixed with the safflower seed and the mixture sown broadcast. About 15 or 20 days after sowing the fields, except those of gram, are watered, and two to three waterings may be given during the period of growth. In February the crop begins to flower and continues to do so till March. The flowers are picked off twice daily, pounded while fresh and squeezed. The yellow liquid extracted by this method is thrown away and the pounded flowers kept for the whole night in a vessel. (The village women usually light a lamp and keep it close to the flowers. The practice is based on a superstition under which they believe that the light prevents the colouring matter from becoming dark, which is undesirable.) The flowers are then exposed to the sun for four or five days until they are perfectly dry and ready for use in dyeing.

Two colouring principles are found in safflower: one is a yellow substance and the other red. The latter, being the tinctorial agent of the flowers, is known by the name carthamin. The yellow substance is removed by washing the flowers repeatedly with water. Weak solutions of carbonated alkalies dissolve the red principle very easily, which is again precipitated on the addition of an acid. Safflower is used for cotton and silk dyeing. The colour it imparts, though brilliant, is of a fugitive character.

Price 12 annas per seer.

**Haldi (Turmeric)**—(*Curcuma Longa*).—The dried underground stem (rhizome) of *Curcuma longa* is known by this name. The plant has broad leaves and bears a large whitish flower, sometimes of a faintly yellow colour. It is largely grown all over India and is produced more or less in every district of Bengal. In the North-Western Provinces it is cultivated largely in many districts, but everywhere more as a spice than for use as a dye. It is seldom grown alone, but often in company with other plants such as *ghuizán* (*Colocasia antiquorum*).

The soil for its cultivation should be rich, friable and high so as not to be flooded during the rainy season. It should be well manured and ploughed. When it is grown by itself the soil is raised into ridges about 10 inches high and 20 inches broad and is then watered twice. In the month of June when the rains set in the cuttings, sets or small portions of the fresh root are planted on the top of the ridges about 1½ to 2 feet distant from each other. One acre of land requires about 900 such sets. The crop generally requires plentiful irrigation and therefore after the rains it is watered weekly. The roots are dug out in December and January and an acre yields about 2,000 lb. weight of fresh roots, which are boiled and dried in the sun to form the turmeric of commerce. The colouring principle of turmeric (*Curcumin*) is a brownish yellow substance. It requires no mordant to dye cotton fibre and gives a golden yellow colour to wool and an orange tinge to scarlet. When it is required to dye with turmeric it is ground on a slab into a paste, which is dissolved in water or boiled and powdered while wet and a decoction made of the paste in water. The cloth to be dyed is steeped in this solution or decoction and dried in the shade. In Kumaun, however, the roots are soaked in lime-juice and borax before being powdered instead of being boiled.

Turmeric gives a dye of a dull yellow colour which is of a fleeting nature. The action of an alkali changes its colour to red. In combination with safflower and indigo it produces different shades of green and orange.

Price 2 annas per seer.

**Al.** (*Morinda Citrifolia*).—It is a small tree chiefly cultivated in the districts of Banda, Hamirpur, Jhānsi and Jalaun and is also grown towards the southern parts of the Cawnpore and Fatehpur districts. The land for its cultivation is ploughed with the *bakhar* plough about five times on the first rainfall. The seed is sown broadcast about the end of July and thoroughly mixed in the ground with the *bakhar*, the quantity of seed being about 2 maunds per acre. In a fortnight the plants sprout and should then be protected from inroads of cattle. During the rains of the second year the plants are 2 feet high. In the third year the roots are dug out in the month of December, dried and packed close in bags, the root produce being about 10 maunds per acre.

The roots are divided into three classes according to thickness:—

- (1) Thin—(*baro*).
- (2) Middle—(*jhāran*).
- (3) Thick—(*pachhkat*).

The dried root is used for dyeing purposes when powdered, being mixed with a little sweet oil. The cloth to be dyed is simply boiled with this powder, alum being used as a mordant. The colour produced is a dull red. The colouring principle of *dl* is termed *morindin* ( $C^{23} H^{60} O^{11}$ ), to whose presence the dyeing properties of the plant are due.

Reports from Bundelkhand districts show that the cultivation of *dl* has greatly diminished since the introduction of European alizarine.

Price—

				Rs.	a.	p.	
The thin roots sell at ...	...	...	...	8	0	0	per maund.
The thick ditto ...	...	...	...	8	0	0	ditto.

**Manjith**—(the Indian Madder)—(*Rubia Cordifolia*).—Two varieties of this plant are met with in India, viz.:—(1) *Cordifolia* proper, and (2) *Khasiana*. The diagnostic characters of the former are that its leaves are five costate, rarely three, their surface being rough. It is found on the Himalayas, chiefly in Bhutan and Sikkim. The plant is not cultivated, but is largely collected as a wild dye stuff and carried to the plains to be sold. The root and the lower twigs are the dye-yielding portions.

The distinctive features of the other variety, which is also uncultivated, are that it has threefold leaves and their surface is smooth. This form is richer in the colouring principle and thrives particularly well in Assam. The latter variety is much used by the natives in dyeing coarse cotton fabrics. The colour obtained from *manjith* is bright but fleeting.

The *khasiana* variety is known to have been formerly cultivated in Kashmir.

*Manjith* does not contain alizarin and its colouring matter is a mixture of purpurin ( $C^9 H^6 O^3$ ) and an orange dye called munjistin ( $C^3 H^6 O^3$ ). The dye is obtained by steeping the cloth in its infusion. The mordants commonly used in these Provinces for fixing the dye are alum and red ochre (an impure oxide of iron).

*Manjith* is largely used at Farukhabad in calico-printing.

Price Rs. 14-0-0 per maund.

**Patang or Bakkam** (Sappan wood)—(*Caesalpinia Sappan*).—This tree grows abundantly in Cuttack and is also cultivated in Central India. The seed is sown in April or May in well ploughed soil and the trees mature in about 20 years, when they attain a height of 40 feet and are cut down.

The price of wood varies from Rs. 2-0-0 to Rs. 8-0-0 per maund.

To extract the dye the wood is either cut into pieces or powdered, and is then boiled in water for about seven hours. The cloth to be dyed red is simply steeped in the above infusion for about half an hour without the use of any mordant. But alum is sometimes used as a mordant, and in some places the infusion is mordanted with both alum and turmeric. In combination with other dyes it produces compound colours.

The colouring principle of sappan wood is termed brazilin ( $C^{22} H^{13} O^7$ ), which exists in the fresh wood in the form of a glucoside, possessing no colouring properties.

This splits up into brazilein ( $C^{22} H^{16} O^7$ ) and glucose by the action of a peculiar ferment.

Sappan wood is not used now to any considerable extent in dyeing, having been driven out by the European red dyes.

**Harsinghar**—(*Nyctanthes Arborescens*).—This is a large shrub with rough leaves and sweet-scented flowers opening at night and falling to the ground in numbers towards the following morning.

The plant is found in most parts of the North-Western Provinces and most abundantly in the Sub-Himalayan and Tarai tracts.

The flowers are chiefly collected and dried to be employed in dyeing. They are rich in colouring matter, soluble in water, and yield a beautiful but fleeting orange or golden dye.

The fabric to be dyed is first drenched in water and then steeped in an infusion made by boiling them. It is then dried in the shade. Alum is the common mordant, but in some places the infusion is mordanted with lime-juice, which renders the colour less transitory. It is sometimes used with safflower and turmeric.

The price of the dried flowers varies from 2 to 4 lb. per rupee, and they are not now commonly used in dyeing on account of the expense.

**Tesu** or flowers of *dhak* (*Butea Frondosa*).—This tree grows abundantly all over the North-Western Provinces on open uncultivated plains. It is one of the most beautiful trees of the plains and lower hills of India. The leaves drop before the plant comes into flowers. It yields a gum which is generally known as *chunia gond* in the bazars of the North-Western Provinces. The tree begins to flower in April and May when the flowers are collected for dyeing purposes. They are called *tesu* and yield a brilliant but fleeting dye of yellow colour, much used by the natives during the *Holi* festival.

To extract the dye a decoction or an infusion is made from the dried flowers and the cloth to be dyed is dipped in this infusion.

The colour produced is brilliant yellow, which deepens into orange by the addition of an alkali.

Lime, in small quantities, is sometimes mixed with the flowers at the time they are steeped in water. Price Re. 1-4-0 per maund.

**Tun** (*Cedrela Toona*).—Tun is a large tree common in the Sub-Himalayan forests. It is largely found in Meerut and Muzaffarnagar districts and is abundant on the lower ranges of the Himalayas, where it attains a height of about 80 feet. It is also sparingly found in most parts of Bengal. It is also cultivated to some extent, but more as a timber than for the sake of the dye.

It begins to flower in April and May. The dye which it produces is of a yellow colour and is extracted by boiling the white fragrant flowers in water, the decoction imparting a fleeting yellow colour to the cloth steeped in it.

In many districts it is only occasionally used by itself, but is mixed with turmeric to produce a deep yellow colour.

In some places the dye is made by adding lime and acidulated water to the infusion. Price 3 annas per seer.

**Kattha**—(Catechu)—(*Acacia Catechu*).—The catechu tree is largely found in Chutia Nagpur, in the jungles on the northern boundary of Ondh, in the Deccan and in certain parts of Bengal.

Catechu or the *Terra japonica* of commerce is obtained from the softer part of the wood. The wood is first boiled in water, and the solution obtained is made to evaporate to a syrup in which catechu coagulates and crystallises on cooling, or the liquid is poured into clay moulds and thus made into cakes. This is known in England as Bengal catechu. Another kind of catechu, which is a product of *Areca catechu*, goes in Europe by the name of Bombay catechu, and is considered to be better in quality.

Catechu contains varying amounts of a kind of tannin called catechutannic acid or miniotannic acid ( $C^{21} H^{18} O^8$ ) and a white substance called catechin or catechonic acid ( $C^{21} H^{20} O^7 + 5 H^2O$ ). The compositions of these substances are however not certain as yet. The Bengal catechu contains less tannin but more catechin than the Bombay variety. Catechu has been used for dyeing and tanning purposes in India from time immemorial.

To extract the dye catechu is ground and mixed in water with a little lime, the mixture being thoroughly stirred with the hand for some time. The infusion thus prepared is strained off and is ready for use.

Catechu produces the various shades of brown colour. An alkaline solution of catechu rapidly absorbs oxygen from the air, forming a brown insoluble substance known as japonic acid, which constitutes the brown colour of goods dyed with catechu, and upon this property its permanence, as a dye, depends. Price 10 annas per seer.

**Harra**—(*Myrobalan*).—(*Terminalia Chebula*).—Term: Chebula is a large tree which attains the height of 80 to 100 feet and is abundantly found in North India from Kumaun to Bengal and southwards in the Deccan tablelands.

The bark of this tree is used for tanning and dyeing. The fruit consists of a central solid mass from which the valuable rind is separated and pounded. A solution is made by mixing it with water and allowing it to soak for some time. The cloth to be dyed is steeped once or twice in this solution, dried and afterwards placed in the dye solution. It acts as a mordant to the actual colours and produces grey and black colours with iron salts, green with turmeric and indigo, dark blue with indigo, and brown with catechu. With alum it gives a yellow colour.

The tree flowers in May and the fruit ripens in September or October.

Two varieties of myrobalan are known in these Provinces, the large and the small. The active principle of myrobalan is a tannin called ellagitannic acid ( $C^{14}H^{10}O^{10}$ ). Price 2 annas per seer.

**Kamila**—(*Mallotus Philippinensis*).—This is a small evergreen tree found in some districts of Bengal, in the forests of the North-Western Provinces, in the Deccan, Northern Circars and Sikkim.

The dye is obtained from its fruit in the form of a red powder found inside the capsules.

The ripe fruits are collected, placed in a cloth and beaten to separate the powdery substance which is used without a mordant in dyeing. The powder is aromatic and yields but little colour even to boiling water and colours it pale yellow.

In presence of alkaline carbonates it produces deep red solutions. A very fine and durable fiery orange colour is imparted to silk by the solution obtained by dissolving the colouring matter with the aid of alkalies.

A complete method of dyeing with this substance has been given under silk dyeing. Kamila is not used in these Provinces for dyeing cotton. Price Rs. 30 per maund.

**Naspal**—(Pomegranate rind)—(*Punica Granatum*).—Pomegranate is a small tree cultivated throughout India in gardens, not for its dye, but for the sake of its fruit. *Naspal* is the name given to the dried rind of the fruit. The tree grows wild in Kumaun and Garhwál whence the rind is imported in considerable quantities to the plains. *Naspal* gives a greenish-coloured decoction when ground and boiled. It is generally used in company with other dyes and acts as a mordant when the rind is boiled with the dye. But when it is used by itself the cloth to be dyed is simply dipped in the infusion prepared by boiling it in water.

The rind is found to contain a moderate amount of yellow colouring matter readily extracted by boiling water and its chief constituent is tannin.

The flowers are used to produce a light red but fleeting colour in some parts of India.

The bark is also used as a dyeing mordant, but only in dyeing and tanning leather. Price 2 annas per seer.

**Babul** (*Acacia Arabica*).—This tree is abundantly found in every part of India and is useful for its gum, timber and seed. It grows rapidly even without watering. Its gum is used in calico-printing and for other industrial purposes.

The bark of this tree is largely used in tanning leather and also in dyeing. The pods are used as a tan and impart a buff colour to the leather.

For dyeing purposes the pods are pounded and boiled, producing a black colour known as *syāh bhurā*, which changes into shades of grey and brown on the application of iron-sulphate solution. All these colours are fast. Price—bark 10 annas per maund.

**The Red Sandal Wood**—(*Pterocarpus Santalinus*).—Sandal is a small tree belonging to South India and chiefly met with in the districts of Madras, where considerable plantations are now in existence.

A dry rocky soil and a hot fairly dry climate are said to be favourable to the development of this tree.

The wood contains a red colouring matter called *santalin*, easily dissolved by an alkaline solution, and is used as a dye. Sandal wood is used in dyeing in the same way as sappan wood.

The cloth to be dyed is boiled with the wood and not merely soaked in it. The reddish tint produced is said to be lasting. Price Rs. 5 per maund.

**Arusa or Rusa** (*Adhotoila Vasica*).—*Arusa* is an evergreen plant, sprouting in the rainy season, when it produces a lovely appearance with its blossoming flowers.

To extract the dye the leaves are boiled in water yielding a yellow colour used in dyeing coarse cloths by the natives. The colour, however, is permanent. In combination with indigo it gives a greenish blue colour.

The stems are used for thatching and also converted into charcoal for making gunpowder. Price Re. 1-4-0 per maund or 2 pice a seer.

**Genda** (Marigold).—*Genda* is a common garden plant extensively cultivated in India. The dyers do not use its flowers for dyeing purposes, but they are commonly used by the poorer classes for colouring their clothes, the colour obtained being a shade of yellow called *yendai*.

The dye is sometimes used instead of turmeric and *harsinghar* to produce *cham-pai*.

In some places the petals of the flowers are dried in the shade and boiled in water. Some alum is then added to the infusion and the cloth to be dyed immersed in it and dried in the shade.

The colour imparted to it is dull green. Price 3 pice a seer.

**Dha**—(Flowers of *Grislea Tomentosa*).—*Grislea tomentosa* is a small, much branched shrub, having flowers all along its branches and common throughout India as a jungle product.

Its gum is largely collected in Mewar and Harauti and is used for the purposes of coating the parts of a fabric to be left uncoloured during the process of dyeing.

Its price is about Rs. 10 per maund. The flowers are employed in dyeing, to produce a colour of their own or as a mordant chiefly with *āl*.

The plant flowers from February to April, when the flowers are collected and dried. They are not ordinarily used as a dye by themselves but as a mordant. When used by themselves they are either boiled in water or steeped in cold or hot water for a considerable time. Alum, or both alum and lime, are then added to the solution as a mordant, and the cloth to be dyed immersed in it several times till it obtains a pink colour.

They contain tannin and also a small amount of a yellowish brown colouring matter soluble in water.

**Dhuamar or Dha** (Gum of *Anogeissus Latifolia*).—*Anogeissus latifolia* is found in the Sub-Himalayan tract, Central and South India and very plentifully in Melghat.

It yields a gum extensively used in calico-printing and which is collected generally in April.

**Asbarg** (*Delphinium Saviculæfolium*).—*Asbarg* is a small herbaceous plant found on the Himalayas on dry hills from Jhelum to the Indus.

The cloth to be dyed is steeped in a decoction prepared from the flowers and the stalks of the plant.

The colour it imparts is known as *gandhaki*. It is made use of in calico-printing and in silk dyeing.

**Baznak**.—The flower of pistachio is known by this name and is used in dyeing silk with cochineal.

**Mendhi**—(Henna)—(*Lawsonia Alba*). *Mendhi* is most abundantly grown in these Provinces as a fence to gardens. It is a small, elegant and sweetly scented bush cultivated commonly throughout India. Henna is rarely used as a dye, but is a favourite with the native ladies, who paint their fingers, nails and feet by covering them with a paste prepared for this purpose by pounding the freshly plucked leaves.

The colour it imparts is bright orange. It is also used for dyeing hair. It is sometimes used for dyeing cloth, but the colour produced is very fleeting.

Price—dry leaves Rs. 3-0-0 per maund.

Price fresh leaves Rs. 1-4-0 per maund.

**Aonla** (*Emblica Officinalis*).—*Aonla* is a tree largely found in these Provinces and bears fruit of a sour taste which is employed in dyeing and for medicinal purposes.

The cloth to be dyed is dipped in the decoction prepared by pounding the fruit and boiling it in water.

Being mixed with myrobalans it plays the part more of a mordant than of a dye. With the sulphate of iron it produces a black colour.

The leaves of the *aonla* tree are used in tanning leather. Price 1 anna per seer.

**Zafran**—(Saffron)—(*Crocus Sativus*).—Saffron is the prepared stigma or stigmas of the saffron orocus. It is very largely and constantly sophisticated by safflower, marigold, &c. It owes its colour to crocin, a glucoside, and is imported into these Provinces from Kashmir. It is rarely used for dyeing cloth owing to its costliness, but very commonly in native medicine and as a condiment yielding a yellow colour. Price Rs. 2-0-0 per oz.

**Kulinjan** (*Alpinia Galanga*).—This is a perennial plant belonging to Sumatra and Java islands, but is now cultivated in East Bengal and South India. The North-Western Provinces receive their supply of *kulinjan* root from the Panjáb. It is made use of in calico-printing along with myrobalans.

**Lodh** (*Symplocos Racemosa*).—This tree is nowhere cultivated, but only grows wild. In these Provinces it is confined to the forests of Bijnor, Kumaun and Garhwál. Its bark is used as a mordant in dyeing leather and calico-printing. The yellow dye which it yields is extracted by steeping it in hot water, and in some places the bark is boiled in water and the cloth to be dyed steeped in the decoction. By boiling the bark with *sajji matti* a red dye used for printing red on white is obtained. It acts as a mordant to *ál*, lac and sappan wood. It is sometimes used with turmeric for dyeing silk yellow and is also employed in the preparation of the powder called "*abir*." Price 3 annas per seer.

**Majuphal** (*Quercus Infectoria*).—This is a middle-sized shrub found in Greece, Asia Minor and Bosnia. The gall nuts used in these Provinces come from oak trees in the Kumaun, Garhwāl and Bijnor forests. The best of these gall nuts are chiefly imported from Calcutta. The cloth to be dyed is dipped in the decoction prepared by boiling the galls in water. It produces a greenish dye and in combination with other dyes it produces different shades.

The galls contain tannic or gallotannic acid to which their peculiar taste is due. Price Rs. 1-0-0 per seer.

**Mulethi**—(Liquorice)—(Roots of *Glycyrrhiza Glabra*).—*Mulethi* is a perennial herb of South Europe, Asia Minor, Persia and Afghanistan. It is neither wild nor cultivated in India and therefore its import is of some consequence. It has been long used in medicine and in dyeing. It is employed in calico-printing to perfume the fabric and give it a finish. Price Rs. 12-0-0 per maund.

**Kapur Kachri** (The root of *Hedychium Spicatum*).—*Hedychium spicatum* is a tree belonging to the Sub-Himalayan forests. Its root is of a reddish colour externally, but internally it is whitish. It is made use of in preserving the clothes from attacks of insects.

The aromatic roots of the above plant are often used as an auxiliary in dyeing to impart a pleasant smell to the fabric. It is used with henna in producing the shade known as *malagiri* in these Provinces. Price 3½ annas per seer.

**Ohharila or Ohharpuri** (*Parmelia Chamchadahis*).—*Ohharila* is a lichen growing on the Himalayan rocks whence it is imported into these Provinces, and is also met with in the North-Western Provinces forests.

It is used in calico-printing to give a perfume to the cloth and to impart a rose tinge to the fabric. Price 6 annas a seer.

**Nagar Motha** (*Cyperus Perennius*).—*Magar motha* is a delicate slender grass met with in damp places in Bengal, Oudh and the North-Western Provinces. The rhizomes are made use of in dyeing to give a scent to the cloth and as a perfume for the hair. The roots are dug out of the fields after the *rabi* harvest. Price Rs. 3-0-0 per maund.

#### B.—OF ANIMAL ORIGIN.

**Lakh** (Lac dye).—Lac is produced by a small insect called the *Coccus lacca*. The insects live on the twigs of certain trees, chiefly *pipal* (*Ficus religiosa*) and *ber* (*Zizyphus jujuba*).

They multiply so considerably that the whole surface of the twigs becomes covered with them. The twigs are broken off and the insects exposed to the sun. This product is stick-lac. It changes into seed-lac when treated with water and dried. Shell-lac is produced by melting the seed-lac and filtering it through cotton. Lac dye has been long used and manufactured in India. It produces a colour similar to cochineal, but not so brilliant.

Lac dye is obtained from the aqueous infusion which remains after washing of the stick-lac by evaporating it to dryness and making it into cakes (*batti lac*, see page 39 in the Chapter on Wool Dyeing). It is chiefly used in dyeing silk, wool and leather.

The methods of extracting the colour and of dyeing with lac have been fully treated under silk dyeing and wood dyeing. Price Rs. 20-0-0 per maund.

**Cochineal**.—Cochineal is the female of the *coccus cacti*, an insect living on certain kinds of cactus, more particularly on nopal plant. Both plant and insect are found in Mexico and Guatemala.



The female insects possess value as a dye and are wingless. They are collected twice a year after they have laid their eggs and killed generally by the heat of an oven.

The colouring principle of cochineal is carminic acid ( $C^{17} H^{18} O^{10}$ ).

Cochineal has been getting out of use since the introduction of the coal tar colours.

Formerly it was largely used in Benares to dye silk for weaving the famous fabric known as *kamkhab*.

#### C.—OF MINERAL ORIGIN.

**Kasis** (Sulphate of iron).—*Kasis* is a mineral substance represented by the formula ( $Fe SO^4$ ) in chemistry. It is very extensively employed for dyeing purposes.

To clear the colour myrobalans are sometimes boiled with it.

It is chiefly employed in producing various shades of grey, drab and black with *harra*, *aonla* and other myrobalans.

In some places it is used in dyeing woollen yarns black and violet. With lime it gives a yellow dye used in calico-printing.

The name *kasis* is sometimes erroneously applied by native dyers to the solution commonly called *kath* prepared by throwing scrap iron into a solution of raw sugar and allowing it to stand for several days till it assumes a black colour.

Price 1 anna per lb.

**Geru** (Red Ochre).—This substance is an impure sesquioxide of iron extensively imported from Gwalior. The *fakirs* and mendicants commonly use it for dyeing their clothes in dull orange colour. It is also used, more or less, by the dyers in the production of various well known colours.

The cloth to be dyed is dipped in the infusion made by pounding it and mixing it with water. It is used as a dye and a mordant in calico-printing.

The red ochre of a lighter colour called *hirmizi* plays an important part in the production of the colour known as *tamesari*. Price 3 pice per seer.

**Rassi**.—*Rassi* is the name given to the salt carbonate of soda. It is prepared from *reh* by dissolving it in water and precipitating the foreign substances. It is used as a soap and a bleaching agent.

**Reh** (Impure Carbonate or Sulphate of Soda).—*Reh* is the name given to the efflorescent salts accumulating in the soil and subsoil waters of large tracts and thereby rendering the land sterile and uncultivable. In these Provinces the lands affected by this substance are called "*usar*." *Reh* is used in place of soap for washing cloth. It is commonly made use of when it is required to dissolve the colouring matter by the action of an alkali.

**Sajji**.—*Sajji* is a mixture of impure carbonate of soda and potash prepared by burning the plants containing alkaline matter, dissolving the ashes mixed with *reh* in water and exposing them to the sun for four or five days. *Sajji* is made use of in extracting the crimson dye from safflower and in bleaching. Price 2 pice per seer.

**Lime**.—Lime is a mineral substance represented by the formula ( $Ca O$ ) in chemistry. It is obtained by burning *kankar* (nodulated carbonate of calcium) which commonly occurs in nature in these Provinces.

It is used as a resist paste with a gum in calico-printing. In combination with sugar it is used to produce fermentation in indigo and in presence of hydrogen converts it into "white indigo." With turmeric it gives a red and with catechu a brown colour. Price 1 anna per seer.

**Shanjarf (cinnabar).—**Cinnabar is known as sulphide of mercury in chemistry. It is found in Native States in Central India and is manufactured in Calcutta. The cloth to be dyed is dipped in the solution prepared by pounding and mixing it with water. The colour it imparts is a fresh pink *shingarf*.

It is not much used by professional dyers. Price Rs. 5-0-0 per seer.

**Tutya (Blue Vitriol).—**Blue vitriol is a mineral substance known as copper sulphate and represented by the formula ( $\text{Cu SO}_4$ ) in chemistry. It is imported into these Provinces from East Bengal. In combination with lime it produces a shade of light blue (*firozai*). Price 4 annas per lb.

**Multani Matti—***mullani matti* is a kind of soft earth of drab colour imported into these Provinces from the Panjáb. It is chiefly used as a soap for washing the hair and body and also as a dye by non-professional men to produce the various shades of buff and brown. Price 1 anna per seer.

**Hartal (Yellow Orpiment).—***Hartal* is a compound of sulphur and arsenic found in nature in the Kumaun hills. It is, however, imported from Calcutta, and is used for producing a yellow colour in dyeing. Price 8 annas per seer.

**Suhaga (Borax).—**Borax is a chemical compound of the elements *boron* and *sodium* found in Tibet. It is occasionally used with turmeric in calico-printing.

**Phitkari (Alum).—**Alum is the double sulphate of aluminium and potassium, imported into these Provinces from Calcutta. It is almost universally used in dyeing operations and acts as a mordant chiefly for turmeric and madder colours. It is very seldom used with safflower. Price Rs. 7-0-0 per maund.

**Abrak (Mica or Tale).—**Mica is a compound of the chemical element lithium, and is used by dyers for sparkling the cloth.

**Zangar (Verdigris).—***Zangar* is a substance known in chemistry as sub-acetate of copper. It is manufactured in Lucknow and used in calico-printing and for dyeing cloth in the shade known as *sangari* (cobalt blue). Dr. Hoey gives the following description of its manufacture in Lucknow:—

“It is made of copper filings by the *sirka kash*. He takes unrefined vinegar and distils it. The *arg* got by distillation is called *argnana*. The process of distillation is as follows:—

“A large vessel is placed on fire and vinegar poured into it. A smaller earthen vessel with a very wide mouth is placed inside. The large vessel is closed air-tight and the vinegar boiled. The distilled vinegar passes into the smaller vessel.

“Two pounds of copper filings are rubbed in 50 lb of *argnana*. Borax (2 oz.) *nausadar*, (sal ammoniac 4 oz.) are mixed while rubbing.

“It is dried in the sun. This process continues for a number of days. Three pounds of verdigris could be got from the above receipt.” Price Rs. 2-4-0 per seer.

#### D.—FOREIGN DYES.

**Of Mineral Origin.**—These are imported from Europe *via* Bombay and are sold very largely all over the country. Even in big villages the *pansari* will be found retailing the more common aniline dyes.

The following is a list of foreign dyes commonly used by the native dyers:—

English name				Native name.
Violet	...	...	...	<i>Bainjani</i> .
Yellow	...	...	...	<i>Basanti</i> .
Scarlet	...	...	...	<i>Gulnar</i> .
Green	..	...	...	<i>Sabz</i> .
Eosine	...	...	...	<i>Gulabi</i> .
Magenta	...	...	...	<i>Abiri</i> .

<i>English name</i>				<i>Native name.</i>
Gold orange	...	...	...	Sonahrá Náránji.
Blue	...	...	...	Nilá Asmáni.
Metanil yellow	...	...	...	Bádámi.
Fast red	...	...	...	Tul ká rang.
Orange	...	...	...	Champai.
Dry alizarine and liquid alizarine	...	...	...	Al ká rang.
Picric acid	...	...	...	Karwazardá.
Congo red	...	...	...	Surkh.
Chinese blue	...	...	...	Waláiti níl.
Turkish red	...	...	...	Surkh.

The dyes manufactured and exported to India by the Farban Fabriken vorm Frideo Buyer and Co., Elberfeld, appear to have found a far greater sale in these Provinces than those sent out by other European firms. At Cawnpore there is an agency of the Elberfeld firm. The retail dealers of Oudh and the Doáb districts purchase the dyes from the Company's agent at Cawnpore. The western districts obtain their supply of foreign dyes partly from Delhi (where there is also an agency of the same firm) and partly from Cawnpore. Most of the foreign dyes are used singly for the production of various colours. Magenta crystals are sometimes combined with indigo to produce various shades of red, blue and bronzo, *e. g.* *bainjani*, *surmai*, *unnabi*, &c., and are used very commonly in places where sappan wood was employed formerly. Alizarine is very largely used in calico-printing and in the manufacture of *kharua*.

## CHAPTER XII.

### THE STATE OF TRADE IN DYES.

The two following statements show the traffic which the several Revenue Divisions of the North-Western Provinces and the Province of Oudh transact among themselves and with other British provinces and Native States of India by rail and with Nepal by road. Figures of road traffic between these Provinces and the neighbouring British provinces and Native States and between the several divisions of the North-Western Provinces and Oudh are not available for any of the past 16 years. Such figures are available for years preceding the last mentioned period, but they are neither of importance nor of interest with reference to this note, and will not therefore be noticed.

*I.—Statement showing average amount of the various dyes imported into the several divisions of the North-Western Provinces and into the Province of Oudh during the ten years 1885-86 to 1894-95.*

Dye.	Place whence imported.	Meerut Division.		Agra Division.		Allahabad Division.		Benares Division.		Robilband Division.		Oudh.		Total.	
		1885-86	1886-87	1885-86	1886-87	1885-86	1886-87	1885-86	1886-87	1885-86	1886-87	1885-86	1886-87	1885-86	1886-87
Indigo ...	By rail from places inside North-Western Provinces and Oudh.	1,164	1,581	1,068	644	1,133	1,201	121	187	181	181	149	249	3,082	4,094
	By rail from other parts of India	1,104	984	313	132	1,454	316	206	...	10	70	31	26	3178	1,507
	By road from Nepal and Tibet ...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
	Total	2,268	2,565	1,381	776	2,586	1,517	326	215	203	203	180	273	6,579	5,599
Myrobalsam	By rail from places inside North-Western Provinces and Oudh.	4,333	8,298	1,818	2,371	7,207	13,489	10	2,224	2,848	1,333	1,358	1,358	27,831	17,515
	By rail from other parts of India	3,576	2,923	505	423	10,803	14,324	397	...	51	104	30	131	15,274	19,986
	By road from Nepal and Tibet ...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
	Total	7,909	11,221	2,323	2,796	18,103	27,793	317	2,224	2,899	1,437	1,489	1,489	43,217	32,769
Gutch ...	By rail from places inside North-Western Provinces and Oudh.	735	902	469	715	10,217	15,916	383	2,202	987	1,393	2,288	2,618	16,039	16,039
	By rail from other parts of India.	145	143	275	353	1,450	1,903	638	1,107	18	369	29	56	2,545	2,545
	By road from Nepal and Tibet ...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
	Total	880	1,045	744	1,068	11,667	17,749	1,011	3,309	2,007	1,806	2,317	2,674	17,604	20,007
Turmeric	By rail from places inside North-Western Provinces and Oudh.	6,105	5,061	8,938	8,035	27,177	19,105	173	1,309	7,963	4,123	8,076	8,076	51,086	48,458
	By rail from other parts of India	9,569	14,424	3,523	9,912	15,669	29,055	7,707	7,777	3,624	681	2,783	2,783	39,141	64,531
	By road from Nepal and Tibet ...	...	...	...	...	...	...	956	1,328	133	133	1,703	1,526	2,850	2,977
	Total	15,674	19,485	12,461	14,947	42,846	48,160	8,839	9,300	11,710	6,307	12,341	12,341	92,047	117,966
Aniline dyes.	By rail from places inside North-Western Provinces and Oudh.	9	12	5	35	42	33	20	53	24	76	66	66	165	223
	By rail from other parts of India.	455	1,801	219	870	676	2,612	31	224	60	123	123	123	1,876	5,755
	By road from Nepal and Tibet ...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
	Total	464	1,813	233	905	718	2,645	51	277	84	199	191	191	1,741	5,978
Other dyes	By rail from places inside North-Western Provinces and Oudh.	4,302	2,751	5,910	2,901	8,593	28,031	2,980	1,514	3,028	1,466	798	798	30,797	84,103
	By rail from other parts of India	46,600	23,353	4,367	6,063	16,207	15,212	4,051	2,490	3,220	3,225	3,186	3,186	78,276	53,761
	By road from Nepal and Tibet ...	14	19	...	...	...	...	367	383	46	66	92	92	492	492
	Total	51,116	26,336	10,213	9,024	24,800	38,276	8,028	4,366	6,294	4,357	4,060	4,060	109,664	88,359
Total ...	By rail from places inside North-Western Provinces and Oudh.	17,148	18,599	18,114	14,781	51,998	72,088	3,686	2,122	15,140	9,935	13,943	13,943	118,680	136,673
	By rail from other parts of India	81,440	49,808	9,231	14,755	40,321	63,452	13,530	12,108	7,486	3,719	5,265	5,265	138,990	147,904
	By road from Nepal and Tibet ...	14	19	...	...	...	...	1,363	1,663	169	169	1,769	1,618	3,469	3,469
	Grand Total	78,611	62,516	27,375	29,536	100,719	136,140	15,566	15,893	22,795	15,140	21,226	21,226	261,137	288,106

II.—Statement showing average amount of the various dyes exported from the several divisions of the North-Western Provinces and the Province of Oudh during the ten years 1885-86 to 1894-95.

Dye.	Place to where exported.	Meerut Division.		Agra Division.		Allahabad Division.		Benares Division.		Rohilkhand Division.		Oudh.		Total.	
		1885-86	1886-87	1885-86	1886-87	1885-86	1886-87	1885-86	1886-87	1885-86	1886-87	1885-86	1886-87	1885-86	1886-87
Indigo ...	By rail to places inside North-Western Provinces and Oudh.	Mds. 1,069	760	Mds. 993	1,022	Mds. 1,313	1,301	Mds. 67	25	Mds. 39	136	Mds. 36	57	Mds. 4,084	3,982
	By rail to other parts of India	14,761	13,641	11,373	12,706	8,264	8,918	6,209	6,209	1,517	1,598	1,153	1,612	43,998	44,709
	By road to Nepal and Tibet	2	...	...	...	...	...	1	...	...	2	...	...	2	3
	Total	15,832	14,401	12,866	14,398	10,155	10,231	6,209	6,209	1,517	1,598	1,153	1,612	48,094	48,094
Myrobalaus	By rail to places inside North-Western Provinces and Oudh.	Mds. 1,021	1,878	143	32	3,822	3,822	13,146	21,695	112	56	166	348	17,615	27,831
	By rail to other parts of India	1,008	3,294	520	626	3,273	4,925	2,591	1,507	13	20	11	0	8,025	10,878
	By road to Nepal and Tibet	...	...	...	...	...	...	...	...	...	...	...	...	...	...
	Total	3,239	5,172	672	658	5,600	8,747	13,737	23,202	125	76	177	351	23,540	38,209
Cutch ...	By rail to places inside North-Western Provinces and Oudh.	Mds. 406	64	67	65	3,816	3,816	311	5,000	1,038	790	9,519	12,251	15,059	23,076
	By rail to other parts of India	496	212	1,692	3,379	8,098	11,828	1,284	1,191	1,487	1,173	41	133	13,098	17,910
	By road to Nepal and Tibet	...	...	...	...	...	...	...	...	...	...	...	...	...	...
	Total	962	276	1,759	3,444	11,726	15,644	1,595	6,281	2,545	1,963	9,560	12,384	28,147	39,992
Turmeric	By rail to places inside North-Western Provinces and Oudh.	Mds. 382	1,077	187	115	13,105	15,557	17,005	10,119	3,165	3,493	17,208	12,097	51,056	48,458
	By rail to other parts of India	7,705	6,027	1,435	1,688	10,201	92,10	13,779	18,419	8,250	6,278	1,093	536	42,463	42,153
	By road to Nepal and Tibet	41	173	...	...	...	...	137	114	...	...	14	47	212	334
	Total	8,128	72,77	1,622	1,708	23,306	24,767	30,045	34,632	11,415	9,771	18,315	12,080	93,781	90,945
Aniline dyes,	By rail to places inside North-Western Provinces and Oudh.	Mds. 4	12	8	3	80	165	73	9	...	7	...	27	165	223
	By rail to other parts of India	19	23	3	4	33	79	1	...	1	3	1	16	58	125
	By road to Nepal and Tibet	...	...	...	...	...	...	...	...	...	...	...	...	...	...
	Total	23	35	11	7	113	241	74	9	1	10	1	43	223	348
Other dyes,	By rail to places inside North-Western Provinces and Oudh.	Mds. 11,306	6,499	1,728	5,829	13,947	6,987	2,569	1,058	660	2,378	587	12,352	30,797	34,103
	By rail to other parts of India	16,276	8,003	2,619	2,065	8,287	8,884	2,221	1,215	1,734	1,153	64	209	31,840	21,529
	By road to Nepal and Tibet	15	9	...	...	...	...	26	20	...	...	4	2	45	81
	Total	27,596	14,511	4,347	7,894	22,874	14,871	4,816	2,293	3,531	2,859	12,503	12,563	62,082	55,063
Total ...	By rail to places inside North-Western Provinces and Oudh.	Mds. 14,848	10,290	3,126	7,736	34,088	30,660	33,175	13,996	6,859	27,515	37,132	118,086	130,073	130,073
	By rail to other parts of India	40,864	31,200	17,051	20,463	38,786	43,844	26,806	28,541	13,002	10,220	2,368	2,542	130,472	136,810
	By road to Nepal and Tibet	58	182	...	...	...	...	183	135	2	18	49	259	368	368
	Grand Total	55,770	41,672	20,777	28,199	73,774	74,504	72,672	43,036	17,081	29,896	39,723	268,417	273,851	273,851

In the returns furnished to the Department of Land Records and Agriculture by the railway offices the traffic under dyes is classified under six heads—indigo, myrobalans, cateh, turmeric, aniline dyes and other dyes. Turmeric was added to the list only in 1888-89. Figures for other heads are available for full ten years. It should be noted here that of these heads indigo and aniline dyes alone are used exclusively as dyes, while of myrobalans, cateh and turmeric only a very small portion is used by the native dyers. A considerable portion of cateh is consumed as an accompaniment to betel leaves so largely chewed by the natives. Turmeric figures conspicuously as a spice in the Indian cookery and a good deal of the myrobalans is used in medicine. It is noteworthy that some of the materials which figure prominently in the dyeing industry of these Provinces, such as safflower and *tesu* (flowers of *Butea frondosa*) are grouped under "other dyes."

*External traffic*, i.e. traffic with places outside the North-Western Provinces and Oudh.

The following table compares the traffic which these Provinces transacted with places outside them during the five years 1890—95 with that in the previous five years:—

Dyes.					Trade with places outside the N.-W. P. & Oudh.			
					Import.		Export.	
					1885—90.	1890—95.	1885—90.	1890—95.
					Maunds.	Maunds.	Maunds.	Maunds.
Indigo ...	...	...	...	...	3,178	1,597	43,998	41,709
Myrobalans ..	...	...	...	...	15,274	18,386	8,025	10,378
Cateh ...	...	...	...	...	2,545	3,981	18,088	17,916
Turmeric ...	...	...	...	...	38,141*	64,531	12,463*	12,153
Aniline dyes	...	...	...	...	1,576	5,755	68	125
Other dyes ...	...	...	...	...	78,276*	53,704	31,940*	21,529
Total					138,990	147,964	139,472	136,810

\* Average for two years 1888-89 and 1899-90.

The traffic in the latter quinquennial period shows more or less increase under all the heads excepting "other dyes," but the increase is most noticeable under aniline dyes which, though necessarily small in absolute quantity, is relatively very large. Turmeric shows a considerable increase, but it is possible that during the first two years during which its traffic was separately registered in the first quinquennial period the registration was not so complete as in the later years, and this furnishes an explanation for some of the decrease. The decrease in the import and export of "other dyes" is no doubt due in a great measure to the daily increasing use of the aniline dyes in preference to the native dyes.

*Indigo.*—The traffic in indigo is one of export chiefly to the port of Calcutta for export to Europe. In 1894 the Provinces had 1,835 factories in working order which manufactured 61,517 factory maunds of indigo and gave employment to 103,121 persons for about six weeks. The amount which figures in its import consists chiefly

in the receipts from the adjoining districts of the Panjáb for re-export and in the return of a small quantity from Calcutta which does not happen to sell during the season.

<i>Export.</i>	1885—90.	1890—95.	<i>Import.</i>	1885—90.	1890—95.
	Mds.	Mds.		Mds.	Mds.
Total export ...	43,998	44,709	Total import ..	3,178	1,597
Export to Calcutta ...	39,738	37,359	Import from the Panjáb ...	2,126	607
			Ditto Calcutta ...	453	538

*Myrobalans.*—Myrobalans are imported chiefly from the jungles of the Central Provinces and Central India. A portion of the imports is sent out to Rájputána and the Panjáb.

<i>Imports.</i>	1885—90.	1890—95.	<i>Exports.</i>	1885—90.	1890—95.
	Mds.	Mds.		Mds.	Mds.
Total imports ...	15,274	18,386	Total exports ...	8,025	10,378
Imports from Central Prov. inces.	5,852	7,537	Export to Rájputána ...	4,600	6,294
Ditto Central India ...	7,213	8,293	Ditto the Panjáb ...	2,762	3,268

*Cutch.*—A small quantity is received from Bengal and Central India, but the jungles of Bundelkhand in the Allahabad Division and in the north of Oudh and Gorakhpur Division produce a large quantity of cutch, and the Provinces are thus enabled to send out a much larger quantity than what they receive from Bengal and other places. The principal recipients are the Panjáb and the Bombay Presidency.

<i>Imports.</i>	1885—90.	1890—95.	<i>Exports.</i>	1885—90.	1890—95.
	Mds.	Mds.		Mds.	Mds.
Total imports ...	2,545	3,931	Total exports ...	13,088	17,916
Imports from Bengal ...	1,005	1,310	Exports to the Panjáb ...	3,400	5,321
Ditto Central India ...	846	1,361	Ditto to Bombay Presidency	4,427	5,286

*Turmeric.*—Turmeric is chiefly imported from Bengal and exported to Rájputána and the Panjáb.

<i>Imports.</i>	1885—90.	1890—95.	<i>Exports.</i>	1885—90.	1890—95.
	Mds.	Mds.		Mds.	Mds.
Total imports ...	38,141	64,531	Total exports ...	42,463	42,153
Imports from Calcutta ...	9,362	39,980	Exports to the Panjáb ...	33,951	31,970
Ditto Bombay ...	849	4,308	Ditto Rájputána ...	8,022	8,347
Ditto Bengal ...	26,022	17,047			

*Aniline dyes.*—The aniline dyes are imported almost exclusively from Bombay port either direct or through Delhi as a second hand transaction, which latter figures as

the import from the Panjáb. Nearly the whole of the quantity imported is consumed within the provinces :—

<i>Imports.</i>		1885—86.	1890—95.	<i>Exports.</i>		1885—90.	1890—95.
		Mds.	Mds.			Mds.	Mds.
Total imports ...	...	3,576	5,755	Total exports ...	...	58	125
Import from Bombay ...	...	1,395	5,110				
Ditto Panjáb ...	...	35	307				

*Internal traffic.*—This traffic, as observed before, is incompletely registered. There is still a considerable traffic by road between adjacent divisions, although it is being absorbed by rail as new lines are opened. The following table shows the net annual import and export of each division during the last five years. The figures of external traffic have also been added :—

<i>Dye.</i>	Meerut Division.	Agra Division.	Allahabad Division.	Bonares and Gorakhpur Divisions.	Robilkhand Division.	Ondh.
	Mds.	Mds.	Mds.	Mds.	Mds.	Mds.
Indigo ...	—11,836	—13,022	—8,714	—5,989	—1,525	—1,426
Myrobalans ...	+0,037	+2,138	+19,046	—22,809	+2,465	+1,120
Cutch ...	+769	—2,376	+2,105	—4,972	—1	—9,510
Turmeric ...	+12,884	+19,169	+23,893	—26,566	+1,816	—1,818
Aniline dyes ...	+1,838	+898	+2,401	+268	+74	+151
Other dyes ...	+11,815	+1,130	+23,405	+1,761	+2,717	—8,593
Total ...	+21,007	+1,337	+61,636	—58,307	+5,547	—20,066

NOTE.—The sign of minus indicates net export, that of plus net import.



## APPENDIX A.

The following is a list of the implements used in the various departments of the dyeing industry:—

*List of implements exclusively used in plain dyeing.*

No.	Native name.	English name, if any.	Brief description.	Purpose for which used.	Weight.		Cost.		Remarks.
					Mds. a. ch.	Rs. a. p.	to	to	
1	Mathor or mât	...	A large oval-shaped earthen vessel	It is buried in the ground up to the neck and is used to ferment indigo in.	0 20 0	0 4 0	to	0 4 0	
2	Nand or nithra ..	...	A circular concave earthen vessel...	Contains the dye solution in which the cloth is soaked.	0 40 0	0 8 0		0 8 0	
3	Lagan	...	A copper basin	Used for lac dye solution while dyeing.	0 4 0	4 0 0		4 0 0	
4	Manjui or guera	...	A square wooden frame supported by four poles.	The cloth strainer <i>dadza</i> used for filtering safflower tincture is fastened to it.	0 5 0	0 4 0	to	0 4 0	
5	Lâthi	Stick	...	For stirring the liquid in the mât	0 20 0	1 4 0		1 4 0	
6	Dadra	Strainer	A piece of cloth 4 square yards made of two folds of strong country cloth.	Used for filtering the safflower tincture.	..	0 1 0		0 1 0	
7	Katora	Cup	Made of copper	Used for transferring dye liquids from one vessel to another.	0 0 2	0 4 0		0 4 0	
8	Lola	Jug	Made of copper	It is used for two purposes (1) to keep dye solutions in, (2) live charcoal is put into it and it is then used for ironing certain dyed fabrics.	0 1 0	1 0 0		1 0 0	
9	Saika	...	...	An earthen jug used in silk dyeing for transferring lac dye from one vessel to another.	..	0 0 3		0 0 3	
10	Karhao	Pan	Made of iron	Used for boiling lac dye	0 15 0	4 0 0		4 0 0	
11	Algani	String or line	Made of <i>monoy</i> or <i>san</i> (hemp)	To suspend dyed cloths on for drying.	..	0 0 6		0 0 6	

